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ECTRICAL REVIEW, JANUARY 9TH, 1942
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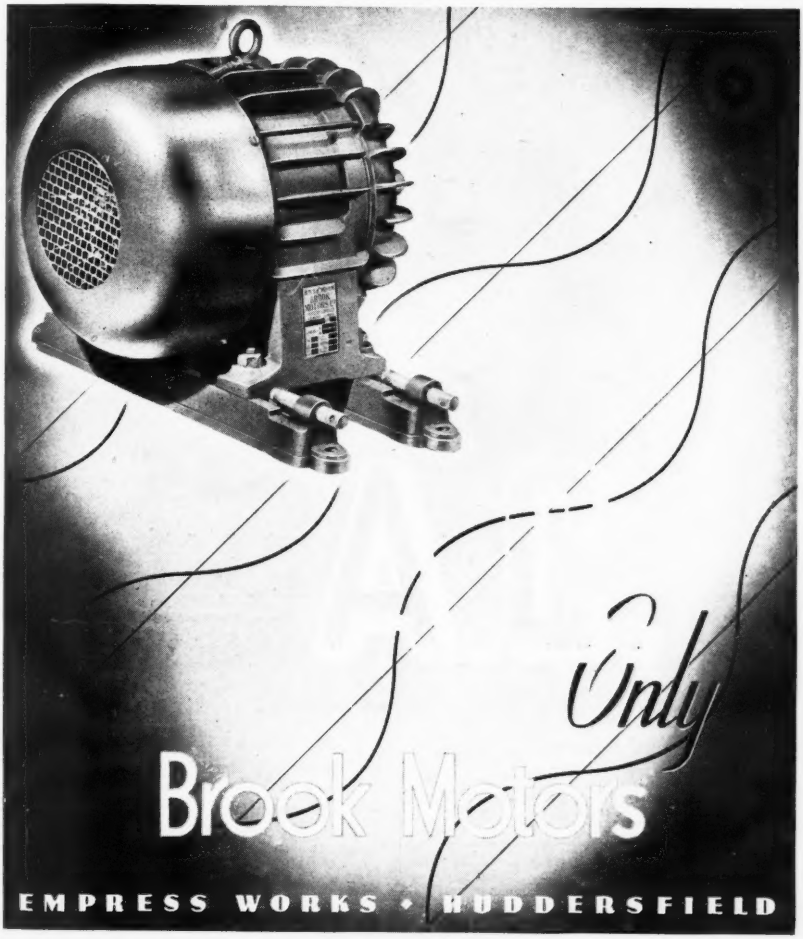
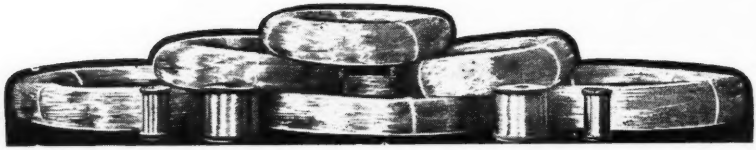
SHIPS' CLOCKS

ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXX. No. 3346 JANUARY 9, 1942 6d. WEEKLY





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ELECTRICAL REVIEW

Volume CXXX **No. 3346**

Friday, January 9, 1942

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3346. JANUARY 9, 1942 6d. WEEKLY

Value for Money

Conservation of Material and Labour

IN the earlier days of the war some members of Parliament and some of the newspapers clamoured for more and more expenditure and they even chided the Chancellor of the Exchequer because he was not screwing enough out of the taxpayer—an extraordinary phenomena which only war could produce.

No doubt these protestants were well meaning but they were rather putting the cart before the horse. What they first should have demanded was full value for the money which was already being spent. Unfortunately, during a war money means nothing. In saner times it can be used as a fairly accurate gauge of effort; if a thing costs too much there are inquiries into causes, but now, of course, we cannot afford any delays which investigation may cause.

"Inquests" of Little Use

It is true that the Select Committee in National Expenditure is still keeping an eye on things but it really constitutes only a Coroner's Court and cannot bring back to service wasted material, time and labour. The Committee will serve a useful purpose, however, if its recommendations are taken seriously and repetitions of careless and incomplete planning are avoided.

But the fact remains that excessive costs mean one of two things—profiteering or waste and even in wartime (if "even" may be permitted) we cannot tolerate either. So far as the first is concerned, we are constantly being assured that a close watch is maintained on contract prices and, anyway, the 100 per cent. E.P.T. discourages that kind of thing. We believe that the electrical industry is blameless in this respect, if there are "black markets" and such elsewhere.

A great deal of latitude must be allowed in the matter of costs where abnormal measures have to be taken to secure rapid results, but even so it must not be taken for granted that results can only be obtained by excessive expenditure.

Waste of money is a mere figure of speech. What is wasted is material, time and labour, three "commodities" which must be conserved and efficiently used when all of them are at a premium.

Full Employment of Resources

This is largely an engineers' war and the nation's fate is therefore in their hands. Engineering connotes the most efficient employment of available resources and this is surely of greater importance now than in peacetime.

The ingenuity of concerns endeavouring to carry on activities not directly devoted to the production of munitions of war is being exercised to the utmost. We would like to see these methods of making the most and the best of what is available extended to the war industries.

We are constantly being exhorted to salvage everything which can be used again. This is extremely important, but it is imperative that the material thus to be saved is kept down to the minimum by ensuring the most economical use of it in the first place.

Control of Man-power

A GREAT deal of confusion exists regarding the Orders which have been made to ensure the best use of available man-power. It arises mainly from the fact that the problem has been approached from two angles. In the first place restrictions have been placed upon the movement of employees in industries scheduled as "essential" by the Ministry of Labour; this applies, *inter alia*, to the electrical installation contracting industry. Secondly, a ban is imposed by the Restriction on Engagement Order which also covers the installation industry, as well as certain other not-very-well defined classes of employees in the electrical industry. But the Restriction on Transfer Order just made for the building and civil engineering industries expressly exempts electrical contractors from its operation. The three latest Orders are dealt with on another page.

Settling Coal Problems

THE Electricity Commissioners have reminded electricity supply undertakings of the existence of the Board of Trade's Public Utilities Coal Committee, whose chairman is Col. J. C. Dalton, to which we referred in our leading article of August 15th last. They are urged to bring to the Committee's notice any points relating to the quality and quantity of coal allocated or delivered to them if they cannot be settled locally. It is obviously better to do this than to approach the Mines Department, the Electricity Commissioners or Members of Parliament directly, for the Committee can appreciate both the national situation and the point of view of the supply undertakings. The Committee's address is Mines Department, Dean Stanley Street, Westminster, S.W.1, where it meets weekly.

Power and Process steam

AGREEMENTS entered into by oil-refining concerns in California with the power company, which are referred to in this issue, illustrate the advantages of leaving to specialists the provision of industrial power. The supply undertaking has installed larger generating units, with lower capital and operating charges per kWh, than would be required to meet the loads of the adjacent works. Stand-by is obtainable from the transmission system, the sets can be run at their most efficient loadings, while operating costs are spread over a greater number of kWh. Also the uncertain incidence of the varying requirements of process steam becomes a minor factor. In the instance cited there is the additional benefit that various waste products can be disposed of as fuel.

Polish Electrical Engineers

THE commendable initiative of the members of the Polish Society of Electrical Engineers in organising a Centre in this country is receiving the support it deserves from our own Institution. Accommodation at Savoy Place is being put at their disposal for meetings and secretarial purposes, and the I.E.E. Local Centres are co-operating in the provinces. So far about seventy of the Polish Society's members are known to be here, but there are probably others not yet traced whose attention we draw to the opportunity thus afforded them of keeping abreast of electrical developments.

Paper Saving

MEMBERS of the Institution of Electrical Engineers can contribute to the paper-saving campaign not only by salvaging waste but also by reducing the amount used in the first instance. If those who do not retain their copies of the *Journal* after reading them will send them back to the Secretary, they will also be doing a good turn to electrical engineers from allied and enemy-occupied countries now in Great Britain for whom the copies are required. Efficient working of such a scheme entails reliance on a regular return each month, but no doubt many members can easily pledge themselves to this.

Bathroom Fire Flex

ACCORDING to the *Electrical Contractor* (which we welcome to the ranks of those who have followed us in the matter of size) the S.W.S. Branch of the Electrical Contractors' Association has complained that often only four feet of flex is received from manufacturers of bathroom fires and in some cases there is none at all. There are many who would say that this wasn't a bad thing; there is already too much flex in bathrooms.

Electric Clocks at Sea

By S. F. Philpott, A.M.I.E.E.

Nearly all modern ships are fitted throughout with electrical timekeeping systems controlled from one master clock. Such installations vary from a few dials to the 600 dials on the "Queen Mary."

CLOCKS on board ship present certain problems which do not arise on land. Pendulum-controlled master clocks cannot be used owing to the motion of the ship and the time indicated must be capable of rapid alteration to correspond with the longitude, the hands being advanced when sailing eastward and retarded when sailing westward. This correction is usually done once daily, but continuous automatic advance is also used to some extent. The clocks, the wiring system and other equipment must be specially designed and protected to withstand the effect of the elements.

Two systems are used. First there is the impulse system in which an impulse every half minute from the master clock causes the hands to move forward in jumps (instead of with a continuous motion as in the case of spring-driven and synchronous clocks. Photographs of a typical master-controller and two types of secondary movement for systems of this kind are shown in figs. 1, 2 and 3. Secondly there is the synchronous system which follows normal land practice in general but is supplied with current from a motor-driven alternator with a special speed controller for accurate timekeeping.

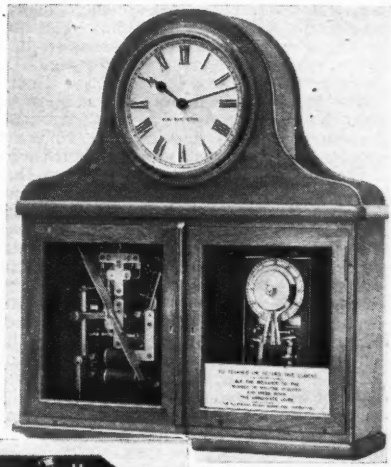


Fig. 1.—"Pul-syn-etic" master controller (Gent & Co., Ltd.). The transmitter is in the left-hand compartment and the automatic advance and retard mechanism in the right

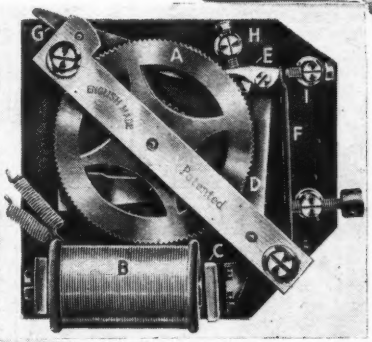


Fig. 2.—Standard dial mechanism (Synchronome Co., Ltd.)

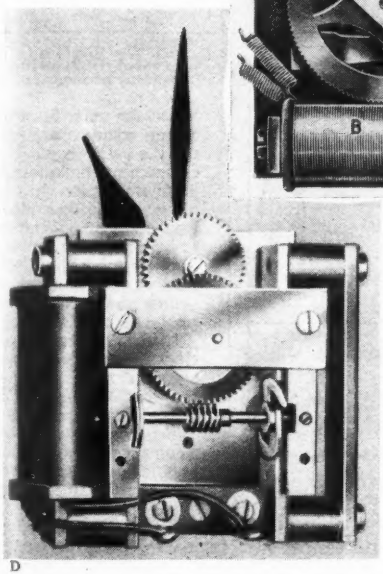


Fig. 3 (left).—Inaudible secondary type movement (Thomas Mercer)

A circuit diagram of a typical impulse clock installation is shown in fig. 4. This consists of the master transmitter, an automatic advance and retard mechanism including a resistance, the clocks, which are all wired in series, and a source of current. It is common practice to mount the master transmitter, together with a pilot dial, and the automatic advance and retard mechanism in the same cabinet. In a

master clock or transmitter for use on land, the time between each impulse, *i.e.*, half a minute, is controlled by the motion of a pendulum, whereas the transmitter used on board ship is operated by a balance wheel. Fig. 5 shows diagrammatically the "Pul-syn-etic" master transmitter (Gent & Co., Ltd.). A is the driving lever, pivoted at B and provided with a driving weight C and a balance weight D. Attached to lever A, is the pawl E, which engages the ratchet F, of the escapement mechanism G. On A is also the contact plate H, whose contact I is in proximity to contact J mounted on armature K, which is pivoted at L.

The sequence of operation is as follows:—Due to the pulling effect of gravity and of the spring M, but restrained by the action of the escapement, lever A gradually falls. When it gets to the lower point of its stroke, contact is made between I and J. Electro-magnet N is then energised and attracts armature K, thereby throwing lever A up and causing the pawl E to be engaged by the next tooth of the ratchet wheel F. The cycle is then repeated. The amount of downward travel is so adjusted that the lever takes exactly thirty seconds to fall.

As the secondary dials are all in series with the contacts and the electro-magnet of the transmitter, they also receive an impulse every half minute. If the dials show the same time when the installation is put into service, they will therefore remain in synchronism. The function of screw P is to act as a fulcrum when lever A is thrown up, thus causing contacts I and J to separate rapidly, making a clean break. The actual movement in this make is detachable.

For advancing all the clocks on the ship when sailing eastward the automatic self-advance. The "advance" lever is then pressed and double the number of contacts are automatically made very quickly by operations of a fly contact (*i.e.*, one contact for each half minute) in rapid succession.

To retard the clocks the pointer of the automatic controller need only be set to the desired number of minutes and the retard lever pressed. All the dials will remain stationary until the required number of minutes have passed when the clocks throughout the ship will automatically restart. When the advance mechanism operates, the pawl E (fig. 5) is thrown back, the escapement stops and a fan (seen in the left-hand compartment of fig. 1) moves quickly instead of the balance wheel.

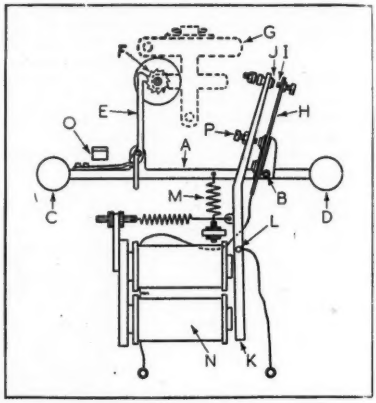


Fig. 5.—Diagram of "Pul-syn-etic" marine master transmitter

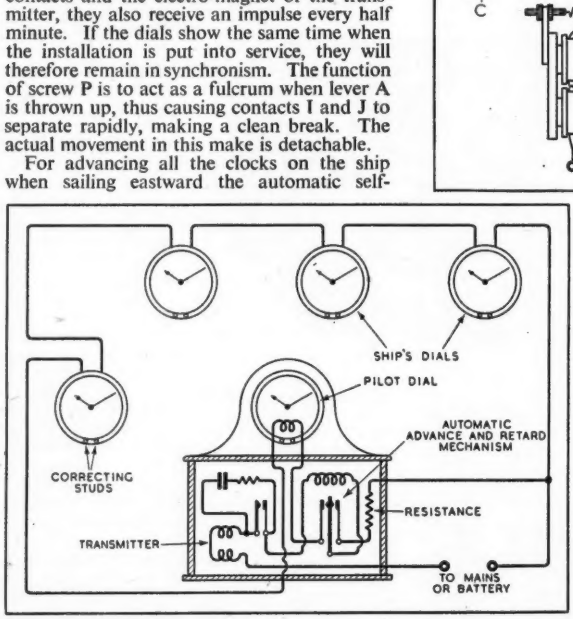


Fig. 4.—Circuit diagram of impulse clock system

When the retard mechanism is in operation, pawl E still hauls the escapement, but the impulse clocks are put out of circuit and their place is taken by an equivalent resistance, the transmitter then operating for a given number of half minutes without driving either the pilot dial or the clocks.

In the Mercer electric clock system for ships a chronometer is used as the control, the fourth wheel of the movement being arranged to work a contact giving a current impulse of 0.3 sec. duration every half minute. The closing of this contact operates a master relay (adjacent to the chronometer) which operates a series of other relays situated in groups

controlling contact is employed. The pointer on the setting dial is turned to the figure indicating the number of minutes it is desired to

all over the ship. Two volts is required to work each repeater. The chronometers are electrically wound by a mechanism operated by the same half-minute contacts on the fourth wheel that actuates the clock dials. Every half minute the spring is normally fully wound, but by cutting out the winding automatically for one hour in every six the main spring receives a full turn to unwind so that any danger of sticking is avoided. In the event of current failure, there is six hours reserve of power always in hand. In addition to the chronometers and relays, the system also incorporates an automatic advance and retard mechanism.

The construction of the secondary dials is very simple. On the spindle which carries the minute hand there is fitted a 120-tooth ratchet wheel and adjacent to this ratchet wheel is an armature operated by an electro-magnet so arranged that each time it receives an impulse from the master clock, that is to say every half minute, the ratchet wheel is advanced one tooth. The wheel thus makes one complete revolution in one hour. A train of gears having a ratio of 12 to 1 drives the hour hand and makes one revolution in twelve hours. There are two types of secondary dial mechanism, the standard movement and the silent. When the actuating magnet in the latter type is energised by an impulse from the master control, the poles in attracting the armature advance the hands of the clock half a minute.

As the armature does not make contact with the pole pieces owing to its being pivoted the movement is silent, whereas in the standard movement there is actual contact between the magnet pole and the armature, resulting in noise at each operation. The silent movement is generally used in cabins.

Secondary dials for impulse clocks are made in various styles to fit in with the scheme of decoration of the ship in general. The clocks are usually fitted with two unobtrusive pins in the front by which they may individually be set to time by means of a dry cell without removing the clock.

Except in relatively small installations, impulse systems are usually made up of groups of clocks connected in series, each group being operated by a separate relay which is in turn operated by the master controller. The energy consumption and voltage per dial varies with the make to some extent. In the "Pul-synetic" system, the current is 0.38 A and two volts is required per dial. The voltage of the ship's DC supply may be reduced to the correct operating voltage by means of a potentiometer. In the *Queen Mary* a special 25-V circuit (by Thomas Mercer) is provided and the clocks are divided into fifty-seven groups of twelve. Alternatively the clock circuit is made independent of the ship's supply by using two batteries of accumulators, the one set being trickle-charged from the main supply while the other is operating the clocks. In addition to the clocks, other apparatus involving a time element is often included in the installation (in peacetime, at any rate) such as a map with a moving model of the ship showing its position at any time during the voyage. Another device is a map of the world with an indicator showing the time at any instant at any part of the globe and whether it is daylight or dark. Electrically operated calendars are also frequently used.

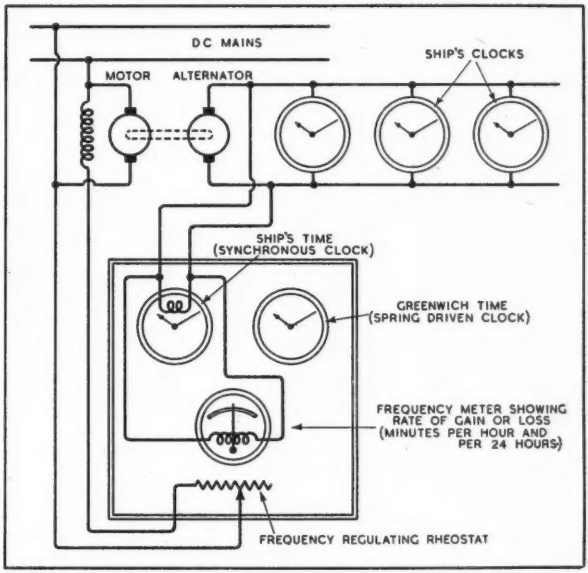


Fig. 6.—Circuit diagram of ship's synchronous clock system ("Harlandic-Synclock")

The majority of ships' installations are of the impulse type described above, but synchronous clocks are used to some extent. The chief advantages of the latter are that the hands progress continuously instead of in half-minute jumps and they lend themselves to being given a constant increasing or losing rate to compensate for the easterly or westerly travel of the

ship by slightly altering the supply frequency. Fig. 6 shows the principle of the " Harlandic-Synclock " system. The motor M is connected to the ship's DC supply and drives an alternator A which is connected to the clock installation and to the control panel. The latter carries three dials. On the top right is a master spring-driven clock which is checked against the ship's chronometer from time to time and on the left of it is a synchronous dial driven from the alternator. This dial indicates synchronous time, that is the time shown by all the clocks in the ships, while the Greenwich time dial is kept at Greenwich time throughout the voyage. The lower dial incorporates an electrical frequency meter which indicates the instantaneous frequency of the alternator, but instead of being scaled in cycles per second it is scaled in the corresponding number of minutes gained or lost in twenty-four hours. The frequency is regulated by means of a rheostat in the motor field, the speed of the alternator being set to give the frequency necessary for the desired gain or loss during the ensuing twenty-four hours, which is calculated in advance by the navigating officer. Where it is desired to advance the clock, as for example in setting to Summer Time the alternator can be given a high speed with corresponding high frequency. It is customary to provide two motor alternators—one of which acts as a standby.

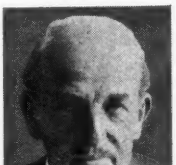
New Year Honours

Awards to Well-known Electrical Men

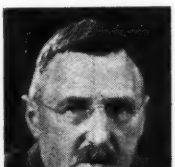
THE list of New Year Honours published on Thursday last we k is a lengthy one, and as was to be expected, is largely concerned with members of the Forces and men who are engaged upon war work. From the list we have selected the names of men associated with the electrical and allied industries.

Commander Sir Charles W. Craven, R.N. (Rtd.), Controller General, Ministry of Aircraft Production and chairman and managing director of Vickers-Armstrong, Ltd., becomes baronet.

Mr. R. W. Allen



Sir Frank Smith



Dr. S Parker Smith

Knighthoods have been conferred upon **Mr. R. W. Allen,** chairman of W. H. Allen, Sons & Co., Ltd.; **Mr. P. H. Mills,** Controller-General of Machine Tools, Ministry of Supply (W. & T. Avery, Ltd.); **Mr. G. C. Usher,** Director-General of Tank Supply, Ministry of Supply (International Combustion, Ltd., & Aberdare Cables, Ltd.); and **Mr. G. H. Locock,** director of the Federation of British Industries. **Sir Frank E. Smith,** Controller of Telecommunications Equipment, has been created G.C.B. for services to the Ministry of Aircraft Production and Ministry of Supply, while **Mr. S. R. Beale,** member of the Industrial Export Council of the Board of Trade and chairman and managing director of Guest, Keen & Nettlefolds, Ltd., becomes a K.B.E. The C.B.E. is awarded to **Mr. G. Ellson,** chief engineer, Southern Railway, for services to civil defence, **Mr. A. P. Rowe,** superintendent of the Telecommunication Experimental Establishment, Ministry of Aircraft Production and **Dr. S. Parker Smith,** Professor of Electrical Engineering at the Royal Technical College, Glasgow.

The Dominions Services List includes **Mr. A. R. Bartlett,** superintendent of the Western Union Telegraph Co., Ltd., St. Pierre, for services to Newfoundland.

In the list of the civil awards the O.B.E. (Civil Division) has been awarded to **Mr. W. Abbott,** Staff Inspector of Engineering, Board of Education, **Mr. P. I. Kitchen,** Principal, Rugby College of Technology and Arts, **Mr. A. P. Ogilvie,** Assistant Controller, Telegraph Branch, London Telecommunications Region, G.P.O., and **Major H. D. Denison-Pender,** Deputy Chief Censor, Telegraph Censorship Branch, Ministry of Information, and a director of the Telegraph Construction & Maintenance Co., Ltd.

The M.B.E. (Civil Division) has been awarded to **Mr. C. E. Baker,** superintending electrical engineer, Admiralty, **Mr. T. Dooley,** superintendent, gun and carriage department, Metropolitan-Vickers Electrical Co., Ltd., **Mr. A. E. Hayward,** assistant engineer, regional director's office, G.P.O., and **Mr. S. Ratcliffe,** chairman of the works committee, Metropolitan-Vickers Electrical Co., Ltd.

In the list of civil awards of the British Empire Medal appear the names of **Mr. G. A. Baker,** assistant to divisional electrical engineer, L.P.T.B.; **Mr. T. Dooley,** inspector (eng.), Telephone Exchange, Londonderry; **Mr. F. W. Perrin,** inspector, Engineer-in-Chief's Office, G.P.O.; **Mr. F. Sharratt,** overseer, P.O. Wireless Station; **Mr. J. W. Hunter,** inspector (trams and trolley-buses), London Transport Board; and **Mr. J. B. Brunton,** inspector, P.O. Engineering Department, Kirkcaldy.

PERSONAL and SOCIAL

News of Men and Women of the Industry

ACCRINGTON Corporation Electricity Committee is to advertise for a new chief electrical engineer to succeed Mr. A. W. Clegg at a salary of £850 per annum, rising by annual increments of £25 to £925. **Mr. A. Goward,** station superintendent, will serve as acting engineer meanwhile at a special salary.

Mr. G. R. Thursfield, M.I.Mech.E., who has been a director of the Igranic Electric Co., Ltd., since its inception, has been appointed managing director of the company in succession to the late Mr. G. A. Mower. He was recently appointed to succeed Mr. Mower as managing director of the Sturtevant Engineering Co., Ltd.

Mr. G. R. Thursfield

Mr. E. Cox, assistant maintenance engineer with the Bradford Corporation Electricity Department, has been recommended for the position of station superintendent at the Hylton Road electricity works of the Worcester City Council. Mr. Cox had already been with the Worcester Corporation as well as the Lancashire Electric Power Co., before going to Bradford.

Mr. R. Mitchell, constructional engineer to the Bradford Corporation Electricity Department, has been appointed to the position of power station superintendent to the Harrogate Electricity Department. He commenced his new duties on January 1st.

Mr. R. M. Gravett, mains superintendent with the Ealing Corporation Electricity Department, has been appointed chief assistant engineer with the Nuneaton Electricity Department.

Mr. J. E. Starkie, A.M.I.E.E., A.M.I.Mech.E., borough electrical engineer of Burnley, is retiring in April. In October last he completed 40 years' service with the Electricity Department, and the Electricity Committee then passed a resolution expressing appreciation of the services he had rendered. He went to Burnley as an assistant, having previously been with Dick, Kerr & Co., of Preston, and succeeded Mr. Birkett as engineer and manager in June, 1905. He has seen great progress in the Department, notably in 1913 and 1922, when new generators were purchased. When the Corporation later desired to erect a new station and extend its area of supply, the Electricity Commissioners decided against Burnley in favour of the Lancashire Electric Power Co.

Mr. J. E. Starkie

Burnley was one of the first three undertakings in the country to obtain Parliamentary powers to sell electrical appliances and install wiring, and has become one of the leading authorities among towns of comparable size in the number of domestic appliances in use.

Mr. Starkie has served for many years on the North-West Area Committee of E.D.A.

It is recommended that the salary of **Mr. J. A. Mould,** city electrical engineer, Leicester, shall be increased from £1,800 to £2,000 per annum as from January 1st, 1942.

Birkenhead Electricity Committee has recommended the appointment of **Mr. W. A. Crocker,** M.I.E.E., technical assistant to the Stretford and District Electricity Board, as deputy electrical engineer in succession to Mr. F. W. Brecknell, who has been appointed borough electrical engineer. Mr. Crocker has held positions at Plymouth, West Ham and Bradford.

To **Mr. Francis Fraser,** who retired last week, is due a generous share of the credit for the progress made by the British Thomson-Houston Co., Ltd., to which he has been secretary for over forty years and a director for twenty-seven years. After gaining considerable commercial and shippiug experience Mr. Fraser spent some time in a solicitor's office in Edinburgh and took a special course of training with a view to joining a firm of building contractors in America.

Mr. F. Fraser

Upon his arrival in the United States, however, he found the building trades practically at a standstill owing to serious strikes, and he entered the employ of the Edison General Electric Co. Later on that company amalgamated with the Thomson-Houston Electric Co. to form the present General Electric Co. (of New York) which was represented in England by the British Thomson-Houston Co., Ltd., formed in London in 1896. In July, 1901, Mr. Fraser was transferred to this London company as secretary, and in that capacity he later moved to Rugby, where the first B.T.H. works had just been built, and where a small body of trained men and girls from the London office formed the nucleus of the Rugby staff.

In spite of his many and ever-increasing responsibilities he has always been ready with a friendly word of advice on any difficult problem ; and that advice has invariably proved to be sound.

Mr. Fraser is a Fellow of the Chartered Institute of Secretaries. He has been a director of the British Thomson-Houston Co. since July, 1914, and was also a director of Ferguson, Pailin, Ltd., and of Albert Frost & Sons, Ltd. Among his Rugby activities outside the B.T.H. works he is a vice-president of the Hospital of St. Cross and a member for many years of its Building Committee. He was one of the founders of the

Lawrence Sheriff Lodge of Freemasons, and a founder of the Rugby United Club, now known as the Rugby Club. His friends and associates will all wish him good health in the enjoyment of his well-earned retirement.

According to *Electrical West* **Mr. J. L. Savage,** chief designing engineer of the United States Bureau of Reclamation, has been "borrowed" by the British Government to act as consultant on several large hydro-electric projects in Australia and India.

Mr. T. H. Davies, A.M.I.E.E., distribution assistant with the Llanelly and District Electric Supply Co., Ltd., has been promoted to the position of mains superintendent with charge of substations. Mr. Davies, who is a past chairman of the West Wales (Swansea) Sub-Centre of the Institution of Electrical Engineers, was educated at the Swansea Technical College.

We offer our congratulations to **Mr. E. E. Sharp,** M.I.E.E., F.B.H.I., who has just completed fifty years' association with the electrical industry. Mr. Sharp, who is well known in the industry through his connection with Venner Time Switches, Ltd., was educated at the South West Polytechnic, Chelsea. After serving with Mather & Platt, Ltd., and the Chloride Co., he joined Venner & Co., who were subsequently merged in Venner Time Switches, Ltd., of which he was one of the founders and has ever since been a director, becoming managing director upon the resignation from that position of Mr. R. C. Graseby, in 1939. Mr. Graseby retained his seat upon the board. For a few years Mr. Sharp was a director of the Jackson Electric Stove Co., Ltd., and he was one of the founders of Tok Switches Ltd.

Mr. E. E. Sharp

He was chairman of the E.I.B.A. for six years and president for 1938. He has also been Master of the Worshipful Company of Clockmakers. Mr. Sharp has served upon the Council of the I.E.E., and has been a member of the Overseas Committee of the Institution. His present address is "The Chummery," Mount Nebo, Taunton, Somerset.

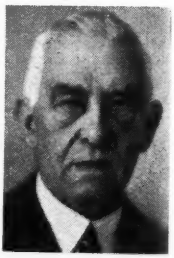
In connection with a scheme of re-organisation of the Norwich Corporation Electricity Department, **Mr. W. G. Weston,** formerly assistant to the administrative officer of the Hackney Borough Electricity Department, has been appointed, and has now commenced his duties, as administrative officer to the Norwich undertaking. Consequent upon the retirement of **Mr. C. W. Appleton,** mains superintendent, on reaching the age limit, **Messrs. Atkins** and **Chamberlain** have been appointed mains development superintendents for the city and county areas respectively.

On December 31st a large gathering assembled in the Committee Room at the Norwich Corporation Electricity Department to say "goodbye" to **Mr. Appleton.** Mr. J. A. Sumner, city electrical engineer, presided and tributes were paid to Mr. Appleton by Messrs. R. E. Atkins and G. Wilson on behalf of the technical and clerical staffs respectively, and by Councillor J. Brooksbank for the Electricity Committee. Written appreciation of Mr. Appleton's assistance to them in their earlier training was read from Messrs. C. Cameron-Kirby, engineer and manager of the Alderley Edge and Wilmslow Electricity Board, A. C. Thirtle, deputy borough electrical engineer of Swansea, and R. H. Matthews, district engineer, Mid-Lincolnshire Electric Supply Co., Ltd. Mr. Sumner, after adding his testimony, presented Mr. Appleton on behalf of the members of both inside and outside staffs with a secretaire, reading lamp and a large number of books.

Obituary

Mr. A. Willis.—We regret to record the death which occurred on December 25th, of Mr. Arthur Willis, who was for many years a member of the B.T.H. Co's traction staff. He was born in September, 1873, at West Molesey, Surrey, and was educated at Christ's Hospital, London. He served his mechanical engineering apprenticeship at Bow, attending classes at the East London Technical School (now Queen Mary College). After working for several years for Sir Frederick Bramwell, consulting engineer, and Mr. W. H. Patchell, chief engineer of the Charing Cross and Strand Electricity Supply Corporation, he joined the traction department in the London offices of the British Westinghouse Co., Ltd. He gained a good deal of traction experience with that company and with the Westinghouse Brake Co., Ltd., and the Metropolitan Carriage, Wagon and Finance Co., Ltd. In September, 1912, he joined the B.T.H. staff as section leader in the traction drawing office at Rugby, and from 1915 to 1939 he was engaged on commercial engineering work in connection with electric railway traction. He became an associate member of the I.E.E. in 1907. He retired in 1939.

Mr. W. H. Liggins, A.M.I.E.E., of Hove, who has died at the age of sixty-six, was connected with the electrical industry for fifty years, and in February last retired from the position of deputy electrical engineer to Hove Corporation. He worked first with the Kensington and Knightsbridge Electric Lighting Co., Ltd., joined the Hove Electric Lighting Co., Ltd., in 1893, and later was for a time with the Charing Cross Electricity Supply Co., Ltd., returning to the Hove undertaking in 1903, where he remained until his retirement last year.



The late Mr. W. H. Liggins

Mr. P. Rutenberg.—The death is announced of Mr. Pinhas Rutenberg, in Jerusalem, at the age of sixty-two. He was born in Russia and after a very active political career became an ardent Zionist. He is best known for his Jordan hydro-electric scheme which is now operated (together with steam and Diesel stations) by the Palestine Electric Corporation, Ltd., of which Mr. Rutenberg was managing director. The company, which was incorporated in 1923, now has over 80,000 kW of generating plant.

Measurement of Gases

Electrical Methods of Computation and Analysis

By T. Thorne Baker,
F.Inst.P., A.M.I.E.E.

Apparatus for wartime requirements, such as the measurement of hydrogen leakage through balloon fabrics and the porosity of parachute materials, is described, and also gas analysers for industrial applications

THE original katharometer for the measurement of leakage of hydrogen through balloon fabrics contained two platinum wire spirals arranged as the two arms of a Wheatstone bridge, the two other arms being fixed resistances of manganin. It is well known that if a constant EMF is applied to a platinum wire surrounded by glass in a small tube, the wire will become heated until an equilibrium stage is reached. If a second wire is exposed to a standard gas, the difference between the resistance of the two at the equilibrium stage can be ascertained independently of the surrounding temperature. In the katharometer

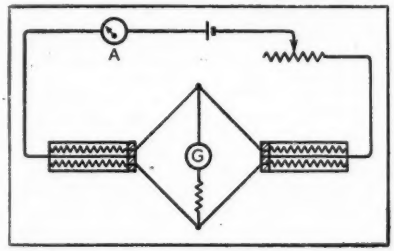


Fig. 1—Katharometer circuit diagram

four platinum spirals were later adopted, thereby doubling the sensitivity.

In order to prevent corrosion and to obtain greater power for the operation of the indicating galvanometer, the platinum wire can be coated with a thin glass sleeve, fused on to it so as to secure good thermal contact. Although this reduces the temperature changes in the wire caused by a change in gas composition, the working current used can be much higher and a distinct advantage obtained. When four spirals are employed (fig. 1) the glass cells of two of them, on opposite sides of the bridge, are filled with a standard gas while the other two are filled with the gas to be measured.

When a balloon is inflated there is a certain leakage of gas to atmosphere which can be made good by the introduction of more hydrogen (or helium). There may, however, be a leakage *inwards* from atmosphere to envelope, affecting the lifting power of the balloon.

An electric gas analyser designed for use in aeronautical work (fig. 2) is contained in a case 13 by 7 by 6 in. The total weight is about 14 pounds. One of the cells contains pure dry air, the other is filled with the gas to be tested by means of a simple aspirator, connection being made to the envelope by a piece of rubber tubing. With pure air and pure hydrogen in the cells the galvanometer registers zero; full scale galvanometer deflection indicates 10 per cent. contamination of the hydrogen with air.

The diffusion of either hydrogen or helium through balloon fabrics depends partly on the nature of the fabric and partly upon the dopes used, while mechanical faults may occur at the seams, etc. Here the electrical testing equipment is used to measure the rate of rise of hydrogen concentration in a closed chamber of known volume, a definite area of which is covered with the fabric. The rate of rise is directly proportional to the permeability and area of the fabric, and inversely proportional to the volume of the chamber. The meter communicating with the chamber is calibrated in percentage of hydrogen. Readings taken at fixed intervals are calibrated against time. The slope of the straight line portion of the curve so obtained is a measure of the permeability of the fabric. A "Balloon Explorer" made by

Fig. 2—Aeronautical gas analyser for testing balloon fabrics

the Cambridge Instrument Co., Ltd., can be applied directly to the surface of an inflated envelope.

An electrically driven suction air pump

forms part of an equipment designed by the same company for testing the porosity of parachute fabrics. Air is drawn by the pump through the sample, the flow being measured by an orifice plate inside the testing chamber, over which the fabric to be tested has been fixed. The dial gauge of a Chattock tilting micromanometer is stabilised at 1 in. water, this reading corresponding to an airflow through the sample of 1 cu. ft. per minute. The pressure difference is then determined by means of the micromanometer, which is capable of giving readings accurate to 0.0001 in. water.

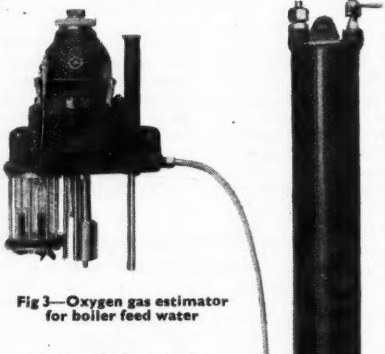


Fig 3—Oxygen gas estimator for boiler feed water

An instrument for the electrical measurement of the combustibility of gaseous mixtures is described by E. R. Davies (*Elect. Journ.*, Nov. 1935). One coil arm of a Wheatstone bridge is immersed in the gas to be tested while the opposite arm remains in air. Any cooling of the bridge wire heated in the gaseous mixture due to an alteration in its combustibility suffices to upset the bridge balance. This out-of-balance is indicated on an empirically calibrated galvanometer as "Safe"—"Dangerous"—"Explosive."

Varied Industrial Uses

Gas analysers on these broad principles are playing a continuously increasing part in industry, and an examination of such meters as are made by the Cambridge Instrument Co. for use in the fixation of nitrogen, for measuring impurities in rare gases distilled from liquid air, controlling the amount of carbon dioxide in the holds of fruit-carrying ships etc., impresses one with the portability and compactness which have been achieved in design, as well as the high order of accuracy maintained.

An important industrial application of interest to engineers is the measurement of oxygen in boiler feed water, which is largely responsible for corrosion. A small quantity of water from the feed system, after being cooled, is delivered to a constant head device (fig. 3) free from exposure to air. It passes thence at a constant rate to a scrubber, where it is scrubbed by a continual flow of pure hydrogen generated in an electrolytic cell. Hydrogen is substituted for the dissolved oxygen in the feed water sample, which issues from the scrubber along with the excess oxygen, and the gaseous mixture is measured against pure hydrogen by a meter of the type already considered. The apparatus may be arranged to operate an electric alarm such as a bell, light, or signal lamp, or to sound a Klaxon horn when the percentage of oxygen rises above a predetermined value.

Gas analyses based on the variation of electrical conductivity of a gas when subjected to the action of a radioactive substance are described by Breitmann and Marsallez. In this method of measurement, two cells, coated inside with a suitable radioactive preparation, are connected in a bridge differentially, one subjected to the gas under test and the other to a standard gas. An amplification unit is used between the bridge and the meter, the galvanometer being calibrated from a number of measurements made with the particular gases concerned.

It is worthy of note that an arrangement based on similar lines was recently described for the detection of incendiary bombs in a report by the I.E.E. Committee on bomb detection recently made to the Ministry of Home Defence. Two cylinders coated inside with the radioactive material are balanced, one containing pure air and the other filled with the surrounding air. The change in the latter introduced by atmospheric contamination when an incendiary is burning in the neighbourhood is sufficient to upset the balance of the arrangement and ring an alarm bell.

Canadian Radio Link

LAST July the first ultra-high-frequency radio circuit for commercial telephone communication in the Dominion was inaugurated between Saint John and Digby, across the Bay of Fundy, and according to *Electrical News and Engineering* (Toronto) its operation has proved to be free from noise or static, while transmission has been very steady. By means of this radio link the distance of communication between the two points is only 40 miles, whereas by pole telephone line around the end of the Bay of Fundy the distance is 400 miles. The radio transmitters have an output of only 50 W, but this is magnified by the directional transmitting and receiving aerials to the equivalent of about 5,000 W. The frequencies employed are 39.98 Mc/s from Digby to Saint John and 37.68 Mc/s in the reverse direction. At these high frequencies the distance which can be spanned is limited to the so-called "line of sight." It has been possible, however, to install the radio terminals at elevations of 300 ft. (Digby) and 470 ft. (St. John), which are well above the line of sight.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Electric Shock

IN the editorial in your issue of December 26th you stressed the need for starting resuscitation early and prolonging this treatment until successful, or until medical advice is given that life is extinct. The fact that great care and attention must be given to the patient and that warmth and rest are essential cannot be over-emphasised. This information is provided in most medical reference books on the subject, and it should be given to all who may be called upon to help in such matters.

A further point is that urgent action should be taken to remove or dislodge the victim immediately he is discovered in contact with an electrically charged object. If the drastic action necessary may result in further physical injury, *i.e.*, by falling, etc., this risk should be taken in order to minimise the time of contact. The possibility of fatal results increases very greatly with the length of time in contact with the charged object.

A further point to be noted is that heart stimulants as part of the first-aid should be avoided.

Nantwich, Ches. A. R. TRAIN.

Preserving Wood Poles

WITH reference to the further correspondence in your issues of December 12th and 26th on this subject, I agree with Mr. Hill's opening remarks, and the importance of ensuring that all bark and inner skin are completely removed from the poles.

From experience it has been found that larch is generally well hearted, but this does not in my opinion affect the importance of ensuring that the sapwood is thoroughly impregnated with creosote oil. It will be appreciated that the whole object of pressure creosoting is to penetrate all sapwood, so forming an impervious casing round the heart. Admittedly the nature of larch makes it more difficult to achieve this object, hence the idea of incising, which is still, unfortunately, not a commercial proposition in the case of round timber. Mr. Hill rather gives the idea of incising without pressure creosoting, which to me seems pointless.

The recent necessity to utilise larch for overhead-line poles has resulted in more practical attention being given to the method of pressure creosoting, and good penetration is now obtainable, and despite the smaller percentage of sapwood as compared with imported red fir, the average absorption of creosote oil by larch is at least 50 per cent. of that of fir.

With regard to Mr. Reynolds' reply in your issue of December 26th, I did to some extent misunderstand his suggested bandaging of poles, and on referring to his original letter I note that it was only intended to bandage about 1 ft. 6 in. of pole at the ground line.

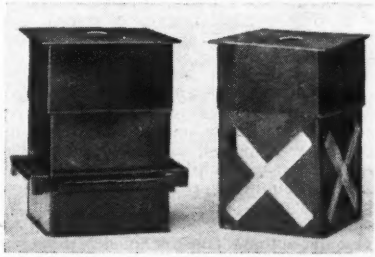
My main purpose in replying to these letters is to recommend the proper treatment of timber, *i.e.*, pressure creosoting, which has proved so effective, in place of bandaging, charring and other similar exterior treatments which are, when all's said and done, inferior substitutes.

CHRISTOPHER WADE

Bedford. (Gabriel, Wade & English, Ltd.).

"Aids to Movement"

THE public is rightly sensitive about bright lights on roads in war-time. While the motorist looms up out of the night with his blinding pool of light, he is quickly gone, but the fixed traffic lamps remain, and if they seem likely to aid the movement of enemy



The two simple "aid to movement" lamps described by the writer

aircraft a brick collected from some handy debris may be used to remove the trouble, or the less drastic expedient may be adopted of draping an old skirt or sandbag round the offending "aid." Let us see to it that it does not offend in the first place.

The photograph shows the two varieties of "aid to movement," each for a 15-W electric lamp. On the left is the red lamp, which has a 0.5-mm. horizontal slot in front of which is placed a ½-in. diameter ruby glass rod which acts as a lens and colour filter. The slot is level with the filament and the lens is adjusted to give a horizontal beam. The effect is similar to the well-known "bull's-eye," but the whole breadth is illuminated from any angle of approach. Many experiments were carried out to find the best style of lamp, in which the technical experts from Scotland

Yard gave invaluable assistance. Poorest results were obtained with a type of lamp giving a large area of low brightness. This was extinguished by a very little haze, giving a practical demonstration of the "Purkinje" effect. The white St. Andrew's Cross lamp conforms to the official requirements and has no glass or other transparent medium in its make-up. Either lamp can be made readily by any tinsmith and I am willing to give working sketches to any lighting engineer interested. This could be made an opportunity for the St. Andrew's Cross to help the Red Cross.

Either kind of lamp can be supported directly from the conduit carrying the supply circuit. A tee-piece and bend can be inserted in the rising conduit saddled to the bollard, and the supply given either from above or below.

Upminster. D. G. SANDERSON, B.Sc., A.M.I.E.E.

Radio Aerial Design

From the Engineer's Point of View

FEW of the many papers that have dealt with the characteristics of radio station aerials have been written wholly from the point of view of the engineer, whose outlook must differ sensibly from that of the physicist. With the object of correcting this disparity Mr. N. Wells (Marconi's Wireless Telegraph Co., Ltd.) presented a paper to the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on January 7th in which low vertical aerials were considered in relation to approximate formulæ for radiation and terminal resistances, the important influence of the earthing system being also examined.

The van der Pol analysis for radiation resistance with respect to vertical aerials of all heights was discussed, various values likely to be met with in practice being presented graphically. The effect of retardation current was dealt with briefly and modified values of radiation resistance indicated. Vertical polar diagrams were next considered, the information gained therefrom being applied to determine the optimum height of anti-fading aerials, including technical details of their design, to reveal the author's constructional preferences in particular respecting the upper section of the structure intended to add top capacitance (usually costly) for bringing about a major change in current distribution of medium-wave aerials with the object of improving the vertical radiation pattern. One form of folded top aerial (at Belgrade) and its service area were described and illustrated, the author remarking that even at this late date it was difficult to dogmatise on the results of substituting a high anti-fading radiator for a low aerial.

Terminal Resistance and Reactance

Finally, two groups of curves were presented for computing terminal resistance and terminal reactance. The first appendix to the paper outlined the calculation of field strength and radiation resistance. The second showed the way in which any distribution of current and voltage along the aerial could be resolved into a primary sinusoidal wattless distribution with an additional feed-current and voltage distribution.

The third appendix to the paper referred briefly to variation of terminal aerial characteristics with atmospheric changes. It also illustrated diagrammatically the principle of the top-fed aerial with its lower end directly earthed, which was intended for a transmitter situated some distance above ground when a vertical aerial was desirable. One example was working satisfactorily abroad on a wavelength of 800/900 m. with masts 20 m. high.

A new high-capacity aerial referred to was in some respects similar to the Alexanderson type, but whereas the latter necessitated a number of separately tuned aerials in parallel and in line, the former needed a number of masts in parallel symmetrically disposed about one common tuning point (the base of the down lead). The novelty of the idea was that, in addition to the capacitance of the down lead and top member, that of the masts was brought into use for long-wave working.

Montaup Extensions

IN earlier issues we have given particulars of the 25,000-kW high-pressure generating plant to be installed early this year in the Somerset (United States) power station of the Montaup Electric Co. Orders have now been placed, it is stated in the *Electrical World*, for a low-pressure section to complete the plant in 1944 as an independent unit. This further extension will consist of a 50,000-kVA 3,600-RPM hydrogen-cooled alternator driven by a 35,000-kW turbine taking steam normally at 400 lb. per sq. in. and 750 deg. F. from the exhaust of the 25,000-kW turbine after reheating or, at need, from the existing steam main.

No new boiler capacity is required as steam will be supplied *via* the h.p. set from the La Mont boiler which is a leading feature of the installation shortly to go into service and the first forced-circulation boiler to be used in a public supply station in the United States. This boiler is rated at 650,000 lb. per hr. with stop-valve steam conditions of 1,825 lb. per sq. in. and 960 deg. F. Pending the addition of the 35,000-kW turbo-alternator, the h.p. set will be used as a topping unit, superimposed on the existing generating sets.

Symmetrical Components

Unbalanced Three-Phase Problems Simplified

By I. D. C.

The author shows by vector diagrams how any three unbalanced quantities can be resolved into symmetrical components

ANYONE who can understand simple vectors can grasp the principle of symmetrical components. The practical engineer finds it a useful help in thinking about unbalanced three-phase problems. It is not an advanced mathematical theorem; on the contrary, it often makes AC problems easier to understand without advanced mathematical treatment.

In the elementary three-phase circuit all quantities are assumed to be balanced. All phases behave in the same way, contribute equally to some polyphase effect such as a rotating field, and may be considered collectively as one three-phase circuit. A three-phase mathematical technique has, therefore, been built up, based on the balanced three-phase circuit. Familiarity with this technique tends to make engineers think of the three-phase circuit as a natural phenomenon. We need to remember that it is an artificial device, a "wangle" producing certain desired results. Quantities are equal and phase displacements are a third of a cycle (or 120 deg. in terms of conventional vectors), simply for the reason that we find it convenient to have them so.

"Phase sequence" is the sequence in which the designer of the circuit chooses to make his three voltages (or currents) rise to their maxima. Vectors are always considered as rotating anti-clockwise. Therefore phase-sequence is denoted by the sequence of vectors counted in a clockwise direction.

The principle of "symmetrical components" is that any unbalanced (inconvenient) system of three-phase currents or voltages may be shown to be equal to the sum of three balanced (convenient) systems, namely:—

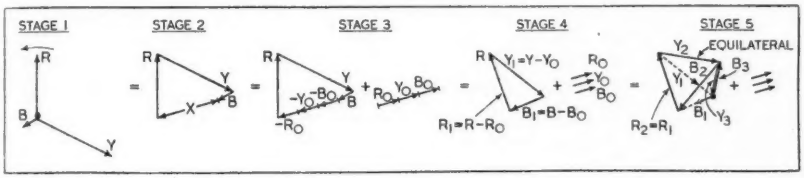
(*a*) A system of balanced three-phase quantities having the normal phase sequence of the system, and called the positive phase-sequence component of the original unbalanced system.

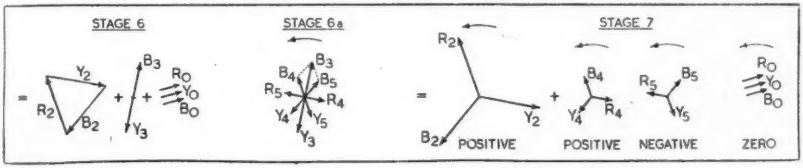
(*b*) A system of balanced three-phase quantities whose phase sequence is opposite to that of the system, and called the negative phase-sequence component.

(*c*) A system of three equal single-phase quantities appearing synchronously in the three-phase conductors, one in each conductor. This system, of quantities which rise and fall together and not in sequence, is called the zero phase-sequence component. It is also spoken of as the "residual" of a set of three-phase quantities which, vectorially, do not balance out.

The addition of the different systems or components is achieved by vectorially adding together phase "A" of the positive component, phase "A" of the reverse ("negative") component, and phase "A" of the "zero" component, and repeating the operation for the other phases.

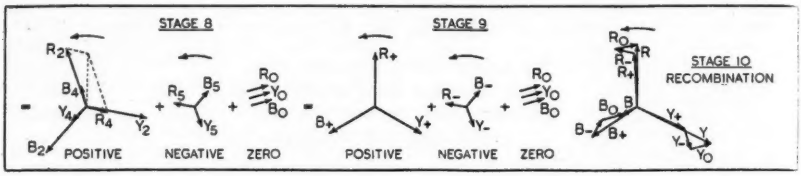
It is easier to understand the separate effects of these component systems of balanced quantities, or "symmetrical components," than to visualise what is happening in three phases which are all behaving in different ways.





The combined effect may be imagined, or more accurately, determined, by adding the separate effects together in the appropriate way.

Most people require to be convinced that any three unbalanced quantities can be resolved into components in the manner described. There are numerous mathematical proofs, but they do not always carry the necessary conviction. The accompanying vector diagrams, with the following brief explanation, give visual proof of the fact.



In stage 1, R, Y, B are three unbalanced vectors. They may be drawn as in stage 2. The vector sum of R, Y, and B is seen to be X. That is:

$$R + Y + B = X$$
$$\therefore R + Y + B - X = O$$
$$\text{or } \left(R - \frac{X}{3}\right) + \left(Y - \frac{X}{3}\right) + \left(B - \frac{X}{3}\right) = 0$$

That is, if X is divided into three equal parts, called R_0, Y_0, B_0 (stage 3) and one of them is subtracted from each of R, Y, and B, respectively, the result is a closed triangle, R_1, Y_1, B_1, stage 4. Therefore the closed triangle plus the equal thirds is equal to the original vector system. The equal thirds, three equal quantities of like phase, are the "zero-phase sequence" component. We choose equal thirds because for the convenience of our method we want equal quantities in each phase.

Similarly, in stage 5, the vector triangle R, Y, B, is equal to an equilaterial vector triangle R_2, Y_2, B_2, plus vectors Y_3 and B_3, which are equal and opposite. That is to say, the original system equals the system shown in stage 6.

Now a simple geometrical sketch (stage 6*a*) will show that two equal and opposite vectors (*e.g.*, the "go" and "return" currents in two conductors) are equal to the sum of two equal sets of balanced three-phase vectors of opposite phase sequence, placed relatively to one another so that one phase cancels out. We thus reach stage 7, from which stages 8 and 9 readily follow. Finally, in stage 10, the components are shown recombined to give the original system.

Multiple-Service Power Stations

Arrangements for Diverse Fuels

A CO-OPERATIVE arrangement for power production has been entered into by the Pacific Gas & Electric Co. and the owners of three oil refineries in California. Its terms, according to an account given in *Electrical West*, provide for the supply of 120 million kWh per annum, with a maximum demand of 20,000 kW, and of 875,000 lb. of steam per hr., the supply company receiving in part payment process waste for use as fuel.

Three stations have been constructed to the same general design, two containing a 40,000-kW unit each and the third two similar units at a total capital cost, exclusive of transmission connections, of $20 million. Three radiant-type boilers per unit are installed, each of a capacity of 200,000 lb. per hr. (overload 230,000 lb.) operated at 1,525 lb. per sq. in. and 950 deg. F. Three multi-fuel burners per boiler permit the use, alone or in combination, of fuels as diverse as acid sludge, pitch, petroleum cokes, natural gas and fuel oil. Boilers, evaporators, fans (with impellers for forced draught and induced draught on the same shaft) and de-aerators are out of doors, a roof for the firing aisles having been provided by placing the hot-air duct between the air heaters and the boilers along the burner fronts.

Three dual-drive feed pumps are installed at each station. The 1,340-HP 2.3-kV motor can be driven above synchronous speed as a 1,000-kW auxiliary induction generator by the turbine on the same shaft.

The tandem-compound main turbines are coupled to 50,000-kVA 3,600-RPM, 12-kV hydrogen-cooled alternators. The high-pressure section of each turbine is designed for a maximum flow of 675,000 lb. per hr. with a back pressure of 225 lb. when the output is 32,500 kW; the low-pressure section is a standard 20,000-kW machine and the two can be controlled separately by combining speed and automatic extraction governing. Steam exhausted from the h.p. section is passed through heat exchangers to produce process steam at 160 lb. per sq. in. superheated by 50 deg. F.

The refineries are fed by 12-kV feeders from the station busbars, from which connections are also made to the 110-kV transmission system of the supply undertaking *via* 25,000-kVA self-cooled transformers.

Tenants and War Damage

Effects of New Amending Act

By F. E. Sugden,
A.C.I.S., Barrister-at-Law

IN 1939 the Landlord and Tenant (War Damage) Act was passed, which laid down, amongst other things, the legal position where premises were damaged, and the procedure for the disclaiming of leases of damaged premises.

There was no doubt of the position when premises were demolished but where owing to blast the top portion or the bottom portion of the premises, but not both, were affected it was considered doubtful whether a tenant could disclaim the lease. Further doubt was expressed as to whether if the tenant or landlord obtained compensation for war damage they were compelled to expend that money on the premises, and, finally, the legal position where there was no lease was very obscure.

There also appeared to be doubt as to whether the War Damage Commission could reinstate premises in their former condition until after the war, but during the "lull" of the last few months, the Commission has undertaken the task of restoring partially - damaged buildings to their former condition.

A new Act clarifies the position of landlords and tenants when buildings are rendered partially uninhabitable by enemy action. The author deals with the principal points

Then the point arose, particularly in dwelling-houses where because only part of the premises were fit for occupation, whether the tenant should pay a proportionate rent for that part of the premises which was fit for occupation. Landlords were very seriously affected through no fault of anyone except the enemy, and as a consequence many of them pressed their tenants for the whole rent. I think I am right in saying that the Courts were uncertain as to what was the legal position, but fortunately there is now some clarification. This is provided by the Landlord and Tenant (War Damage) (Amendment) Act, 1941.

Definition of "Dwelling-house"

Previously many enactments granted relief to dwelling-houses only, but Section 1, Subsection 10 of the new Act lays down that the term "dwelling-house" means a house, or part of a house, let as a separate dwelling (for example a flat) and does not exclude the house or part of a house so let by reason only that part of the premises is used as a shop or office or for business, trade or professional purposes. This definition means that large premises which were formerly used for residential purposes, and owing to changing conditions and changing events have been converted wholly or partly into factories or workshops, shops or offices, are now protected by the new Act.

The Landlord and Tenant (War Damage) Act, 1939, protects people with long-term leases, but no provision is made for short tenancies. The term "short tenancy" is defined as any tenancy or sub-tenancy which the tenant is entitled to determine at any time by a notice expiring not later than the end of the next complete quarter or the next complete period of three months of the tenancy, or in which a person is holding his premises by virtue of the Rent and Mortgage Interest Restrictions Acts, 1920-1939, the Court (Emergency Powers) Acts, 1939-1941, or the Liabilities (War Time Adjustment) Act, 1941.

The reference to the Rent Restrictions Act means that if on the expiration of any period the rateable value of the premises is less than one hundred pounds, the tenant is entitled to hold over at least for the duration of the present war, or longer, if it is so provided by future enactments. This means that if the landlord is offended because the tenant demands his rights, he cannot give the tenant notice to quit when he is offered rent only for the part of the premises which can be occupied. The tenant cannot be compelled to pay rent for a portion of the premises damaged and made uninhabitable by enemy action.

The Court (Emergency Powers) Act protects a tenant who is being sued for the recovery of possession of his premises and the payment of rent, when he cannot pay, not because he has specifically suffered damage to his premises which might nevertheless be the case, but because he has been adversely affected as a consequence of the war, *e.g.*, he may have suffered a serious decrease in trade. The intention of the Act was to prevent honest people going bankrupt as a consequence of the war.

Inspection by Local Authority

As I have said the position affects private dwelling-houses and business premises alike. Many explanations of the Act have overlooked the procedure to be adopted by the tenant, which should be carefully followed in order to avoid heavy costs.

I strongly advise the tenant in the first instance to ask the local authority to inspect the premises and later application should be made to the authority to carry out "first-aid" repairs, etc. The services of the local authority

should be enlisted because if at a later date the premises get into disrepair through the fault of nobody but merely through effluxion of time and subsequent subsidence of premises primarily caused by enemy blast some time ago, or if the premises have not been repaired fully, then the local authority will issue a certificate revoking any notice that the premises are fit for habitation.

The next question is:—What rent shall be paid by the tenant? My answer is, the proportion of the whole rent that the undamaged part bears to the whole premises. For instance, suppose the damaged portion of the premises was one-third, then the tenant should pay two-thirds of the rent until the premises are repaired.

Here comes the difficulty regarding the procedure to be adopted. Every tenant's desire is to avoid being landed for costs in the Court, and the Court frequently leans toward the litigant who has taken reasonable steps to avoid litigation. Thus my advice to the tenant is: first of all inform the landlord of the damage, stating all particulars, and make sure that there is proof of posting the notice, either by obtaining a certificate of posting or sending it by registered post.

Offer of Rent

Make a reasonable offer of rent to the landlord. In order to safeguard his interests, the tenant is strongly advised to err on the generous side. If the landlord ignores the request repeat the process perhaps a second or third time just to show that all reasonable steps have been taken. Then if letters are ignored one would be inclined to go to the local County Court and ask it to apportion the rent and decide what payment is reasonable for the undamaged portion of the premises. The Judge will hear the facts, and the local authority will give evidence regarding the condition of the premises. Otherwise it might be necessary to call in a surveyor or an estate agent, which, of course, entails cost. No doubt the Court will accept the certificate of the local authority without calling an official of the authority to prove its contents, which is usual in most cases.

If the tenant can prove to the Judge that he has taken all reasonable steps to avoid proceedings by making a reasonable offer to the landlord or by requesting an amicable settlement, and that the landlord has refused to treat, as we term it in law, then the Judge will be disposed to award no costs to the landlord or will probably go further and award all costs to be paid by the landlord to the tenant. Thus the tenant in all probability will not eventually have to pay any costs except, as it were, to finance the transaction in the Court. But he will be in a position to recover the money later from the landlord.

I should mention that if the landlord has made the premises fit for habitation and the tenant has not returned to them for three months after they have been fit the landlord will have the legal right to let the premises to some other tenant. There is also another relief in favour of the landlord in that if after the premises are made fit for habitation the tenant leaves his furniture in the premises, or visits the premises from time to time removing some of the furniture or taking steps to preserve the furniture, or retains the key, that in itself is not sufficient to prove that the tenant is still in occupation. Formerly if the tenant had his furniture on the premises or still retained the key he was held to be the tenant, and the landlord could not recover the premises without first obtaining an Order of the Court.

It will be remembered that provision was made in the 1939 Act for disclaiming the lease where the premises were totally unfit for habitation. If the tenant serves on the landlord a notice of retention which is conditional upon the premises being made fit in the future, that may be treated as a notice of disclaimer. That notice must also be served upon the War Damage Commission. If the landlord receives payment to put the premises in a satisfactory condition he must carry the work out; the War Damage Commission will decide what work is necessary. If a tenant receives payment for similar purposes, where he is under an obligation to repair, the work must be carried out within six months. After the premises have been repaired to the best of the landlord's or tenant's ability, as the case may be, then the lease shall be modified accordingly.

Frequently the point has arisen where this disclaiming of lease also applies to ground leases. It is also equally applicable if there is a clause in the lease that the tenant shall be held to insure against war damage. This will be inoperative where the premises are in urgent need of repair as a consequence of enemy action and it is necessary to take steps to prevent deterioration. Then the landlord or the tenant has the right to enter according to the appropriate nature of the transaction.

Converting Salvaged Paper

IN renewing our appeal to readers to continue their paper-salvaging activities throughout the coming year we may refer to an interesting conversion job carried out by Crompton Parkinson, Ltd., which links up with the subject.

The establishment is a mill nearly 200 years old which after running on water for most of its life was converted to gas-engine operation and then was changed over to electrical drive. It is at present principally occupied in converting waste paper into detonator and flare tubes, shell components, etc., for Royal Ordnance Factories.

Power is provided by a 175-HP three-phase, 50-cycle, 400-V, 500-RPM auto-synchronous motor designed to run at unity power factor at full load. A V-rope drive is employed and the power factor is maintained at above .90 lagging.

The supply is brought in at 11 kV and stepped down to 400 V by a 250-kVA B.E.T. transformer. The cables were produced by Derby Cables, Ltd.

Defining Power-Factor

Unbalanced Three-phase Load

By Prof. G. W. O. Howe, D.Sc., M.I.E.E.

IN an article in the ELECTRICAL REVIEW of October 3rd, I discussed the various ways in which it is possible to define the power-factor of an unbalanced three-phase load. In a subsequent letter (ELECTRICAL REVIEW, October 31st) I discussed an ambiguity in one of the definitions published by Curtis & Silsbee, of the American Bureau of Standards, in connection with which I have received a letter from them, thanking me for pointing this out and proposing a modification of the definition along the lines suggested in my letter. I would also like to draw attention to the article by G. F. Freeman in the ELECTRICAL REVIEW of November 28th, dealing with the same subject from a somewhat different point of view.

In this article Professor Howe deals with correspondence arising out of his contribution published in our October 3rd issue and reinforces his original argument

Of the six definitions it was seen that three, although apparently very different, always give the same result; these are the vector, the algebraic, and the positive phase-sequence methods. The constructions employed in the first two are thus really methods of eliminating the negative phase-sequence component. Simplicity of construction and brevity both suggest that this power-factor should be called the vector power-factor by whichever method it is determined. It is the power-factor that one would obtain for an unbalanced load on an alternator from an observation of the regulation of the alternator voltage. It is associated with a definite angle of lag or lead. Mr. I. D. Campbell, in his letter published on October 17th, maintains that this is the " true " power-factor of the system, but this depends, of course, on the definition of true power-factor.

Voltage and Current Assumptions

I assume throughout, for the sake of simplicity, that the voltage is symmetrical and that both voltage and current are sinusoidal. If by true power-factor one means the power-factor due to lag or lead of the load as a whole, then this is undoubtedly the true power-factor. If, for example, one phase carries a heavy lagging current while another phase carries an equally heavy leading current, the vector power-factor may be unity although the power transmitted is much less than could be transmitted by the same currents.

In the same issue, another correspondent, Mr. E. W. Hill, who has given considerable attention to the problem, and who is known in connection with the Hill-Shotter kVA maximum - demand indicator, strongly supports an entirely different definition of power-factor, *viz.*, that based on the arithmetic sum. In this method the equivalent volt-amperes are obtained by multiplying the voltage to neutral by the sum of the three line currents, irrespective of whether they are leading or lagging. In a private letter a well-known professor of electrical engineering assures me that he is going to stick to this definition.

With this definition it is meaningless to ask whether it is a lagging or a leading power-factor, as the above example shows. It has the advantage of extreme simplicity, and in all but very exceptional cases it is a rough approximation to the equivalent copper-loss power-factor, which is the ratio of the actual power to the maximum power that could be transmitted with the same copper losses.

The only other definition that has been suggested is the ratio of the actual power to the maximum power that could be transmitted if each phase carried a current equal to the heaviest line current. Although in certain circumstances this ratio might be of some importance, such circumstances are so improbable that one is perhaps justified in omitting it from the recognised definitions of power-factor.

We are therefore left with three power-factors, the vector, the arithmetic and the equivalent copper loss, of which the second is a simple and in most cases near enough approximation to the more scientifically based third value ; accepting this approximation we may therefore say that there are only two power-factors, *viz.*, the vector and the equivalent copper loss. Each of these has its applications. For many purposes it would be advantageous to regard the latter as the product of the former and a factor which would depend on the amount of unbalance.

Unfair to Penalise Consumers

Where there is a tariff depending on the power-factor, it does not seem right to penalise ordinary consumers because of the unbalance factor of their power-factor. In a single-phase three-wire system one may penalise a consumer because he takes a lagging current but not because he is connected across one side only of the system; it is assumed that by suitably connecting other consumers, the system as a whole will be approximately balanced, and the same

assumption may be made in the case of a number of consumers on a three-phase system. Hence, in such cases any power-factor tariff should be based upon the vector power-factor. This argument does not apply to large consumers, who should certainly be encouraged to take a balanced load by a tariff based on the equivalent copper-loss or arithmetic power-factor. This question of tariffs, however, goes beyond the scope of my article, which was written with the object of eliciting opinions as to the definitions of power-factor which one might reasonably expect to find in a glossary of terms used in electrical engineering.

Labour Control

Regulations Affecting the Contracting Industry

THREE Orders relating to the building and civil engineering industries have just been made with a view to ensuring that proper use is made of the available man-power.

The first is the Essential Work (Building and Civil Engineering) (No. 2) Order, 1941, which amends the original Order of this title so that the emergency provision under which an employer could transfer a consenting worker away from a scheduled site in an emergency now applies only when the worker is transferred to work urgently required to be done as a result of enemy action.

The Order applies, *inter alia*, to the construction, alteration, repair, decoration or demolition of buildings; this has been interpreted as including electrical installation work. It is now made clear that a branch, department or part of a local authority or public utility undertaking (*e.g.*, building or maintenance department) is within the scope of the Order.

The period for appeals against decisions of National Service Officers is reduced from fourteen to four days, although delayed appeals may be accepted in suitable cases. Provisional certificates of registration may now be extended for a maximum of six months.

Re-engagement of Workers

The Undertakings (Restriction on Engagement) Order, 1941, supersedes and revokes the 1940 Order of similar title and the Electrical Installation (Restriction on Engagement) Order, 1941. The object of the amendment is to prevent an employer from re-engaging a worker at any time except through an Employment Exchange. If, however, a worker is stood off for temporary reasons, such as weather conditions, he may be taken on again. It is expressly stated that the Order applies to civil engineering contracting undertakings, electrical installation undertakings and general engineering undertakings. The definition of civil engineering contracting undertakings includes the construction of plant foundations, cooling towers and ponds, cable trenches and ducts, and erection of overhead line supports.

The Order covers any branch, department or other part of any organisation which is mainly engaged in these activities, whether it is or is not a building or civil engineering contracting undertaking. Where, however, the organisation is that of a local authority or is a public utility undertaking, it is not considered to be a building or civil engineering contracting undertaking unless it is wholly or mainly devoted to the carrying on of these activities for persons other than those controlling the organisation of which it forms part, entering into contracts with it or with that organisation.

"Electrical installation undertaking" is defined as an undertaking wholly or mainly engaged in the installation, maintenance or repair of electrical equipment, including accumulators, batteries, bells, lamps, signs, sparking plugs, switches, telephone and wireless instruments, wires and cables, dynamos, generators, motors, transformers and any other equipment of a similar nature.

"General engineering undertaking" means an undertaking which is wholly or mainly engaged in the manufacture, assembly or repair of goods or articles of steel, iron or non-ferrous metals which involves the use of machine tools, foundry or forging plant (but not ship work).

Transfer Restrictions

The object of the Building and Civil Engineering (Restriction on Transfer) Order, 1941, is to ensure that an employer does not collect and transfer from one job to another a labour force to which he has no exclusive claim, thereby denuding a district and preventing other efficient but less fortunate employers from securing the labour needed to complete important work. No transfers of employees in the specified industries may be made without the sanction of a National Service Officer.

Among the classes of employer exempted from the operation of the Order are local authorities and public utility undertakings in respect of all persons directly employed by them and all undertakings, branches or departments wholly or mainly engaged in electrical contracting and in contracting work for the production, distribution and maintenance of gas, water and electricity supplies. Also, until January 31st, exemption is applied to all employers with a total of not more than twenty foremen, craftsmen and labourers in respect of transfers from one site to another within ten miles from the head office.

COMMERCE and INDUSTRY

Nickel and Cadmium Control.

Non-Ferrous Metal Control

THE Minister of Supply has made Orders placing under control cadmium and nickel.

The Control of Non-Ferrous Metals (No. 6) (Cadmium) Order, 1941, prohibits the acquisition of cadmium ores, metal and scrap containing more than 50 per cent. of cadmium except under licence; consumers of 10 lb. or less per month are exempt from the requirement. The Order also fixes maximum prices for the metal.

The Control of Non-Ferrous Metals (No. 7) (Nickel) Order, 1941, provides that no person (other than a consumer of not more than 1 cwt. a month) shall acquire unwrought nickel, nickel alloys or scrap (other than iron and steel scrap) containing more than 5 per cent. of nickel, except under licence.

Both Orders take effect as from January 1st, and inquiries should be addressed to the Non-Ferrous Metals Control, Grand Hotel, Rugby.

Return of Oil Drums

The attention of electricity supply authorities has been drawn by the Electricity Commissioners to the urgent need for the prompt return of empty oil containers to their suppliers. The Petroleum Department of the Board of Trade has stated that it will not be possible to maintain the distribution of lubricating oil with the amount of steel now available for the production of new drums unless all users return their "empties" without delay.

Although this appeal is addressed to supply undertakings it has, of course, a wider application and all other oil users in the industry are asked to note it.

Croydon Adopts Chiefs' Scale

At a recent meeting of Croydon Town Council it was decided, on the recommendation of the Electricity Committee, to adopt the National Joint Committee's agreement regarding the salaries of chief electrical engineers within three months after the end of the war, or such earlier date as might be decided. It was stated that the present salary of Mr. F. N. Rendell Baker was in excess of the scale; no alteration would be made until the scale salary exceeded the amount paid.

Building Industry Organisation

The Minister of Works and Buildings has asked the Building Industries National Council to assist him in collecting the information for a close analysis of the many sections and branches that go to make up the building industry in its widest sense. This arises naturally out of the inquiry made earlier in the year by Mr. Justice Lewis at Lord Reith's request.

At the present time, no clear picture exists of the many interests which are affected by, or affect, building and public works construction. There are almost innumerable federations, associations, institutions, societies, groups, etc., and the extent to which any interest has organised representation varies from the almost complete to the non-existent. All this is a serious handicap to any real attempt to formulate a comprehensive organisation for the whole industry. Within such a framework must, it is felt, come the following five sections: Professional, builders and contractors, operatives, manufacturers and distributors.

The B.I.N.C. has now been asked to collate information regarding all existing representative organisations—namely, the name, object and description, number of members, qualification for membership, and in trade organisations, where possible, the extent to which it covers the particular trade. No lists of members are wanted. Lord Reith has no doubt that all concerned with the industry appreciate the necessity of accurate information before plans can be made and invites their full co-operation.

Electricians' Increased Bonus.

Electricians' War Bonus

In accordance with the Wages (War Adjustment) Agreement made between the National Federated Electrical Association and the Electrical Trades Union on November 24th, 1939, the National Joint Industrial Council for the Electrical Contracting Industry states that as from the second pay day in January, for the pay period covered by that pay day, the cost of living (war) addition will be 18s. 9d. per week (an increase of 5d.). This addition will remain current up to and including the first pay day in April.

Wages in the Cable-Making Industry

The Joint Industrial Council for the Electrical Cable Making Industry announces that the cost-of-living index figure at December 1st will not involve any alteration in wages on the third pay-day in January.

War Damage Insurance

A new quarterly period of insurance of business equipment under Part II of the War Damage Act began on January 1st and runs until March 31st. The premium for this period is 7s. 6d. per £100. Insurance is compulsory where the value of the business equipment held exceeds £1,000. Below this limit insurance is voluntary.

All those who are compulsorily insurable, or, if voluntarily insurable, wish to be covered against war damage to their equipment, who have not already taken out a policy for the six months from October 1st, 1941, to March 31st, 1942, must apply to their fire insurance company or Lloyd's for insurance for the period of three months from January 1st.

Weld Dimensioning

The system of weld dimensioning which is explained in a 16-page booklet containing 35 sets of diagrams and symbols issued by Murex Welding Processes, Ltd., Waltham Cross, Herts., is intended for the instruction of draughtsmen. The system has been devised to enable them to convey on drawings all the information needed to indicate how arc welding should be proceeded with, corresponding to the familiar codes employed by long-standing practice in drawing offices for dimensioning riveted and bolted work. The need for some similar form of guidance in the parallel field of welding has been self-evident. Some of

the proposals made have been adopted in their countries of origin, but none has yet found favour in Great Britain. For this reason the Murex system has, with slight modifications, been based entirely on the method already firmly established in the riveting trade.

Rubber Data

A useful chart entitled " Rubber Data for the Engineer " has been sent to us by the British Rubber Publicity Association, of 19, Fenchurch Street, London, E.C.3. It is divided into three sections—soft vulcanised rubber, hard rubber, and sponge and cellular rubber. The first two sections are subdivided under such headings as energy absorption, thermal properties, mechanical properties, etc., and by means of a moveable indicator the properties and applications of the different types of rubber can be seen at a glance. Copies of the chart can be obtained on application to the Association.

Reducing Sheath Corrosion

Satisfactory results are reported in the *Electrical World* as a result of applying corrosion-inhibiting compound to the bitumen covering of buried lead-covered cables. The Detroit Edison Co. uses 1 per cent. by volume of sodium silicate and sodium dichromate in 10 gal. of clay-base emulsified bitumen. The dichromate requires to be neutralised in order to avoid precipitation of the emulsion and gelatinisation of the silicate, so its crystals are dissolved in just enough water to give a red saturated solution, which is converted to a yellow neutral sodium-chromate solution by adding sodium hydroxide. The compound becomes dark brown with the consistency of thick cream and dries in less than an hour.

About 0·001 per cent. of a solution of silicate or 0·5 per cent. of chromate protects the sheath from corrosion, but a combination produces the best results. Excess chemical is used in order that seepage out of the coating may provide a protective film for a long time. As the compound does not function adequately below 45 deg. F., about 5. per cent. of alcohol is added.

Large Discharge Lamps

Mercury-vapour discharge lamps of a size reported by *Reuter's Trade Service* to be larger than any hitherto made anywhere are to become available from the General Electric Co. of America after January 1st, 1942. They are to be known as the GE " Mazda " AH.9 type, of 3,000 W, with a rated output of 120,000 lumens and are designed particularly for use in steel mills, foundries and other large industrial buildings. Although eight times more powerful than their largest predecessors, the length of the discharge tube is only four times that of 400-W mercury lamps rated at 16,000 lumens, which have become the chief, and sometimes the only, source of artificial illumination in many American factories.

Machinery Control

The Board of Trade has made the Machinery, Plant and Appliances (Control) Order, 1942. This supersedes the previous Orders and one of its principal features is the exemption from licence requirements of prime movers or electrical machinery or plant for driving machinery or plant which has already been licensed, provided that driving means are not already available.

Data on Cast-Iron

A booklet has been jointly prepared by the B.S.I. and the Iron and Steel Control section of the Ministry of Supply to furnish information which will enable engineers to design in accordance with the increasing requirements, necessitated by heavy demands on foundry capacity, to use malleable cast-iron for castings formerly made of steel and grey iron for those previously composed

British Investments in Argentina

SOME interesting statistics relating to the amount of British capital invested in Argentina were given in a recent radio talk by Ing. Julio A. Noble, a prominent citizen of Buenos Aires. As reported in the *Monthly Journal* of the British Chamber of Commerce in Argentina, Ing. Noble, whose aim was to refute the idea that Great Britain had a financial " stranglehold " on Argentina, said that of the investment of 1,275 million pesos in electricity supply, gasworks, waterworks and sanitary works British capital represented 119 million, less than 10 per cent. The British had practically no share in the telephone and radio-telephone services in which the capital invested was 371 million pesos.

As regarded tramways, the situation was equally clear, since out of the originally calculated 700 million involved, only 272 million was of British origin. The executive influence wielded was in even smaller proportion, since a good part of the capital involved was in the form of debentures. " We have the case of the Anglo-Argentine Tramways Company, of whose capital of £8,950,910 sterling only 40 per cent., or say, £3,600,000 is in British hands. Of the £10,340,000 of issued debentures, 97 per cent., or £10,000,000 are British, and have no effect upon the executive privileges connected with the management of the company's affairs. It is a well-known fact that this undertaking is controlled by ' Sofina,' an international electrical organisation composed of Belgian, German, French and Spanish capital. Hence the Transport Corporation is not a British entity.

" Neither is the *frigorifico* (chilled meat) industry, in spite of the fact that Great Britain is practically the only client for our meat exports. The capital of all the British *frigorificos* is 149 million pesos against a total of 350 million."

In the case of the foreign-owned railways, of a total of 3,723 million pesos invested, 3,323 million was British. These investments had no doubt been profitable at times, but they were no longer so and the control of the railways was no longer a privilege by any means. Since 1930 the net profits, prior to the deduction of exchange losses, had never exceeded 2.88 per cent. and in the last ten years had averaged below 2 per cent.

Of 588 million pesos of foreign capital invested in Argentine manufacturing industries, 291 million was British, 258 was North American, 7 million was French, 7.7 Belgian, 11 million Dutch, 6.8 million German and 5 million Swiss.

The total amount of foreign capital tied up in Argentina was 9,056 million pesos, of which 5,441 million was British, 1,771 million American, 1,009 million Belgian, 481 million French, 79 million Italian, 41 million Dutch and only 35 million German.

of steel or malleable cast-iron. Copies are obtainable for 5s. 5d. post free from the British Standards Institution, 28, Victoria Street, London, S.W.1, and further technical information, or the names of contractors who undertake various classes of cast-iron work, is obtainable from an advisory panel, c/o the Director for Iron Castings, Iron and Steel Control, The Clarendon, The Parade, Leamington Spa.

Changes of Address

The Electrical Trades Union has moved to Swinton House, 324, Gray's Inn Road, London, W.C. 2 (telephone: Terminus 5115).

Rediffusion, Ltd., has moved for the "duration" to Victoria Station House, Victoria Street, London, S.W. 1 (telephone, Victoria 8831; telegraphic address, Stanrelays, Sowest, London).

The Aluminium Information Bureau has removed to new premises at 109, Jermyn Street, London, S.W.1 (telephone: Whitehall 5411). The technical and advisory services of the Bureau will, as hitherto, be available to deal with problems submitted concerning the working, treatment and application of aluminium and its allovs.

The wholesale business of Electrical Engineering Supplies (B'ham), Ltd., has been transferred to larger premises at 137, Sherlock Street, Birmingham, 5, as from January 1st, under the direction of Mr. H. D. Lloyd.

New Catalogues and Lists

Metropolitan Electric Supplies, Metway Works, King Street, Brighton.—List No. 61241, giving the latest prices of "Metway" elements for fires, irons, kettles, wash boilers, water heaters, etc.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—The December stock list of surplus new and second-hand electrical material.

British Insulated Cables, Ltd., Prescot.—Leaflet N.S.G.7 on B.I. flux solder.

Calendars and Diaries

The diary bound in blue leatherette, sent to us by I.C.I. Metals, Ltd., a subsidiary of Imperial Chemical Industries, Ltd., not only has very adequate space for making daily notes, but has the useful addition of several tables relating to copper. A window at the back of the binding enables it to be used as a season ticket holder.

A very useful calendar with bold lettering on monthly sheets has been sent to us by the Davenport Engineering Co., Ltd.

"Where's My Penny?" is the anxious inquiry of the small boy searching through his pockets depicted on the calendar with monthly sheets sent to us by Brittain's Electric Motor Co. (formerly Langdon-Davies Electric Motor Co.)

A calendar with large daily slips, each bearing a quotation, has been sent to us by Revo Electric Co., Ltd.

Mitchell Electric, Ltd., has sent us a calendar with monthly sheets, decorated with a large picture of a golden spaniel, entitled "A Friend to the End."

We have received another of their useful engagement calendars with monthly sheets from W. H. Sugden & Co., Ltd.

A refill for their desk calendar has been sent to us by Landis & Gyr, Ltd.

A moveable red indicator on a transparent band is a feature of the "At-a-Glance" calendar with monthly sheets sent to us by Mr. Francis C. Polden, of Francis Polden & Co., Ltd.

Illustrations of some of their products appear on each of the monthly sheets of the calendar which we have received from Crofts (Engineers), Ltd.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of the dates shown :—

December 24th.

MORCO (design). No. 613,687, Class 9. Accumulators, batteries, transformers, distribution boards, wire, push-buttons, cables, vacuum cleaning apparatus, conduit material, flat irons, kettles, domestic floor polishing, waxing and scrubbing machines, flexible conductors, switches, switchboards, soldering irons, curling tong heaters, plug contacts, hot water jugs, urns, coffee percolators, waffle irons, milk boilers, porringers, frying pans and saucepans, all being electrical goods. Also No. 613,688, Class 11. Electric cooking apparatus, fans, heating apparatus, toasters, lamps, lamp bulbs, radiators, immersion heaters, lighting apparatus and fittings, hair dryers, wash boilers, drying cabinets and airers, towel airers, etc.—T. B. Morley & Co., Ltd., Liberty Chambers, Jameson Street, Hull, and Morco House, Aire Street, Leeds.

IVERITE. No. 616,221, Class 9. Insulated electric cables and insulated electric wire. Also No. 616,222, Class 17. Insulating materials. IVERTHENE. No. 616,223, Class 9. Insulated electric cables and insulated electric wire. Also No. 616,224, Class 17. Insulating materials.—Britannic Electric Cable & Construction Co., Ltd., Thorney Lane, Iver, Bucks.

PEREGRINE. No. 616,886, Class 9. Electric soldering irons and soldering appliances.—Aircraft Patents, Ltd., Myddelton Hall, Almeida Street, Upper Street, London, N.1.

FLEXELLA. No. 616,759, Class 17. Electric insulators.—Lionel Robinson & Co., Ltd., 3, Staple Inn, London, W.C.1.

December 31st.

THERMEX. No. 616,848. Class 9. Wires and cables for electric transmission systems. British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, W.C. 2.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

VEE GEE sticky thread.

LINALITE dual-purpose cooking and heating appliance.

NEW BOOKS

Care of Radio Sets. Solving Vibration Problems.

Radio Receiver Servicing and Maintenance. By E. J. G. Lewis. Third edition. Pp. 253; figs. 111. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 8s. 6d. net.

The third edition of this manual on radio service work has not been extensively revised, but a 23-page chapter dealing with press-button tuning and automatic frequency control circuits (often associated with automatic tuning) has been added. This contains a good deal of useful information on all forms of automatic tuning, though the motor-driven type comes in for the fullest treatment.

In referring briefly to the system which performs automatic waveband changing as well as station selection, the author mentions that an extra motor is used for this. It should be pointed out that in at least one British receiver, a single motor performs both functions in succession. Dealing with mechanical systems, it is stated that in the cam-operated type each cam has a slightly different shape. Actually, the cams are usually all identical in shape, and it is solely their relative positions on the drive spindle which control the station selected by each one.

However, these are small points which do not detract from the general excellence of the information provided. This is essentially practical, and is very well illustrated by line and half-tone reproductions. Although the author modestly claims that the book is an "introduction" to servicing and maintenance, the information given in its 253 pages, if backed up with some practical experience, should enable the vast majority of faults to be located and repaired.—W.E.M.

Practical Solution of Torsional Vibration Problems, Vol. II. By W. Ker Wilson, Ph.D., M.Sc., Wh.Ex., M.I.Mech.E. Second edition. Pp. 715; figs. 131 and tables 38. Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price 42s.

In our review of Mr. J. P. Den Hartog's "Mechanical Vibrations" (ELECTRICAL REVIEW, October 17th, page 407), the importance in modern engineering of a study of vibrations and of their control was stressed. While it is impossible to draw fine distinctions as to the relative importance of any specific form of vibration, it certainly is true to say that torsional vibration presents a larger and more extensive and perhaps more insidious problem than any other. The value of such a book as this, which traces the principles and methods of computation to be adopted through a long series of practical problems, is therefore obvious.

Originally published in one volume in 1935, this highly specialised work had rapidly to be enlarged and the first volume of the new two-volume edition appeared in 1940, to be quickly followed by the second. Dr. Ker Wilson has, over a long period, made a special study of torsional vibration, particularly in relation to internal combustion engines, and is therefore particularly well qualified to give reliable guidance in this elusive problem, as his responsible associations with the De Havilland Aircraft Co., D. Napier & Son, and the Daimler Motor Co. will testify.

The rapid extension of his book is in itself evidence of the rate at which progress in its elucidation has been taking place during the last few years. From its title we can perceive the author's purpose to have been the demonstration by practical solutions of such concrete problems as represent a sufficiently wide range of engineering experience. This, carried out on the scale adopted in this treatise, would have been a work of the highest value, but with the instruction given in the principles on which each solution is based it is possible for any reader to extend the applicability to his own particular problem.

The second volume commences with the determination of stresses due to vibration at resonant speeds and besides other new details there are discussions on fatigue strength with and without structural discontinuities such as oil-holes, keyways, fillets, and so forth, and the influence of surface hardening processes and corrosive environments.

Another valuable feature is the inclusion of data upon fatigue strength of crankshafts derived from full-scale tests. Mechanical and electrical apparatus for the measurement of amplitudes and stresses and their theory, calibration and practical limitations are fully discussed. The analysis of torsiograph records has been extended and the work on damping devices brought up to date so as to include the theory and practical application of rotating pendulum vibration absorbers.

This comparatively recent device is already regarded as one of the most important contributions to high-speed engine design and its treatment here is clear and explicit. Some additions have also been made to the chapter dealing with the dynamic characteristics of electric generating sets direct-coupled to internal combustion engines. As in the other sections the treatment is practical and illustrates by examples cyclic irregularity and other aspects. Momentary governing to meet the lag in the response of the fuel pump at sudden changes of load and the flywheel effect to avoid electrical resonance are among the problems resolved.—J. A. C.

Shorter Notices

Electrochemistry and Electrochemical Analysis.—Vol. III. Electrical Methods applied to Titration, Moisture Determination and pH Measurement. By H. J. S. Sand. Pp. 118; illus. Blackie & Son, Ltd., 66, Chandos Place, London, W.C.2. Price 5s. 6d.

Physics for Engineers. By Sir Ambrose Fleming. Pp. 232; illus. George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Price 7s. 6d.

Batti-Wallahs' Society

THE president and Committee of the Batti-Wallahs' Society, in sending us the season's greetings, state that there is small chance of the Society's meetings being resumed at present, but that the Committee will act directly conditions permit.

ELECTRICITY SUPPLY

London J.E.A. Expenditure. Swansea Wiring Scheme Suspended.

Colne.—FUEL ECONOMY.—In announcing a reduction in the guaranteed minimum annual consumption provided for in the two-part tariff for residential premises from 500 to 400 kWh per annum Councillor Duckworth, chairman of the Electricity Committee said that this was done in the hope of economising in fuel, but advised consumers that it was not economy to substitute a coal fire for the electric radiator in the front room on Sundays.

Glasgow.—HOSPITAL HEATING.—The Health Committee is considering alternative heating systems for a section of the Robroyston Hospital.

MAINS EXTENSIONS.—Mains are to be extended by the Electricity Committee at a cost of £2,427.

Highlands.—HYDRO-ELECTRIC DEVELOPMENT.—A meeting of representatives of Highland counties is being held with a view to reaching agreement as far as possible regarding the evidence which is to be submitted to the Government Committee.

Hull.—LINK WITH C.E.B.—The Electricity Committee has approved arrangements for affording an additional link between the Central Electricity Board's 132-kV system and the Electricity department's 22-kV system.

FANS.—The Emergency Committee is to install electric fans for improving the ventilation at rescue, decontamination and repair depots.

Llanfairfechan.—NO TWO-PART TARIFF.—The U.D.C. has decided to postpone the adoption of a two-part tariff *sine die*, owing to the Government's fuel economy campaign and has asked the Electricity Committee to consider the question of reducing the power tariff. Mr. Price F. White, consulting engineer, explained that the purpose of the two-part tariff was to induce customers to use more energy for cooking and heating.

London.—J.E.A. LOANS.—The London and Home Counties Joint Electricity Authority is applying to the Electricity Commissioners for sanction to borrow the following amounts:—Mains and services, £30,000; substations and equipment, £10,000; meters, £6,000; cookers, £4,000; and other consumers' electrical apparatus, £1,000.

Consent has recently been received to borrow £9,500 for substations and equipment; £5,500 for meters; and £4,000 for cookers.

BOILER PLANT.—Before the war the London Power Co. applied for sanction to the installation of three 150,000 lb. per hour boilers at one of its stations, but the work was delayed by the war. The company now proposes to install four boilers (110,000 lb. per hour) giving about the same capacity but greater flexibility.

ST. MARYLEBONE.—The Borough Electricity Committee is to convert premises into a static transformer substation at a cost of £2,300.

SOUTHWARK.—The Works Committee is to purchase two electric power rammers at a cost of £205.

Middlesbrough.—EXTENSION.—The Town Council is applying for sanction to borrow £897 in connection with a proposed low-voltage extension in the Cannon Street area to improve the voltage.

PROTECTIVE WORK.—It is proposed to spend £900 on protective work.

Northampton.—SUBSTATION EXTENSION. — The Northampton Electric Light & Power Co.'s substation in Duston Road is to be extended.

Paisley.—LOWER CHARGES.—A new scale of electricity charges approved by the Council comes into operation on February 15th. A copy of the revised schedule which we have received from Mr. Daniel Ross, the engineer and manager, shows that the lighting flat rate is being reduced from 4½d. to 4d. per kWh, and the primary charges of the residential two-rate and commercial shop lighting tariffs are similarly lowered. The domestic service tariff running charge is reduced from 0.6d. to 0.5d.; the revised schedule retains with this tariff the offer of a free cooker and kettle if the consumer pays for a minimum annual consumption to the value of £4. The power rates have been altered and a coal clause has been incorporated for the smaller consumptions. The new Schedule A power charge is 2d. per kWh for the first 4,000 kWh per annum and 1½d. per kWh for the next 46,000, plus 0.0012d. per kWh for each penny increase in the price of coal above 26s. 6d. a ton, the present price. (The superseded Schedule A is a flat rate of 2¼d. per kWh up to 10,000 kWh per annum). The new Schedule B is the same as the old Schedule C, but commences at 50,000 instead of 100,000 kWh per annum.

Sheffield.—MAINS EXTENSIONS.—The Corporation Electricity Committee is to extend the mains at a cost of £4,507.

Stoke-on-Trent.—SUPPLY EXTENSIONS.—The Electricity Committee has obtained consent to the erection of overhead lines for various supply extensions.

LOANS.—Application is being made by the Committee for sanction to borrow £10,000 for mains and services.

Swansea.—SUSPENSION OF ASSISTED WIRING.—At a recent meeting of the Corporation Electricity Committee the electrical engineer reported that owing to the shortage of skilled electricians it was becoming increasingly difficult to give reasonable attention to applications for the wiring of premises under the assisted wiring (hire purchase) scheme, and the Committee decided to suspend the scheme during the war.

FIRE-FIGHTING EQUIPMENT.—Substation fire-fighting equipment is to be provided at a cost of £1,100.

Thornton Cleveleys.—SUPPLY TO PREESALL.—The Electricity Commissioners have authorised the Council to supply electricity to the Preesall district.

Tottenham.—SHELTER HEATING.—The Emergency Committee has obtained sanction to expend £1,580 on heating air-raid shelters.

Watford.—STORAGE HEATERS.—At a meeting of the Electricity Committee the general manager reported on the difficulty of continuing to maintain the storage cylinders hired to consumers owing to the shortage of replacement parts and the difficulty

of obtaining new cylinders. The Committee recommends the discontinuance of the hire of these heaters during the war.

MODIFIED LIGHTING.—At a meeting of the Highways Committee the town clerk submitted a letter from the Ministry of War Transport stating that it was in favour of " starlighting " and that the Ministry of Home Security, which was primarily concerned, was doing all it could to encourage the extension of this lighting. The borough engineer gave details as to cost and was authorised to ascertain if it would be possible to obtain materials and sanction to proceed.

West Hartlepool. — STANDBY STAFF. — The borough electrical engineer has been instructed by the Corporation to ask the Electricity Commissioners whether it is necessary for a standby staff to be on duty at the electricity works during the full 24 hours each day.

Whitehaven.—MINIMUM CHARGE.—The Electricity Committee is to consider a suggestion that the minimum charge of 30s. a year should be abolished.

Overseas

India. — RURAL ELECTRIFICATION. — The Bhatghar hydro-electric scheme sanctioned by the Government of Bombay in 1938 in order to develop rural electrification is now in operation. Six transformer stations have been established and energy is supplied for lift irrigation and for lighting and power purposes. Two pumping plants have also been installed and water is delivered to villages for agricultural purposes. The scheme, though experimental at present, promises to be remunerative when fully developed, states the *Indian and Eastern Engineer*.

United States.—POWER PRODUCTION.—Electric power produced in the United States for public use in October totalled 14,992 million kWh, an increase of 17 per cent. on October, 1940, reports the Federal Power Commission. This is the third month in which the daily average production set a new high record.

FARM ELECTRIFICATION.—Nearly 1,400,000 farms in the United States have substituted electric light for the oil lamp in the past 6½ years, according to the Department of Agriculture. This brings the total to over 2,000,000, or 34.9 per cent. of the number in the country. The actual number of farms receiving central station electric service at June 30th, 1941, was 2,126,150, against 743,954 at January 1st, 1935, the year in which the Rural Electrification Administration was established. New Jersey ranks first among the States in rural electrification. Out of about 25,000 farms, 24,000, or 92 per cent., were receiving central station electric service at June 30th last. This is an increase of 8,838 farms since the beginning of 1935, at which time the State had a farm electrification of 57.6 per cent. and ranked fourth. The State with the largest numerical increase in farms electrified since the establishment of R.E.A. is Ohio. Between 1935 and the middle of 1941 Ohio increased the number of its electrified farms by 104,952, or 218.4 per cent.; Ohio has 233,738 farms of which 153,000, or 65.4 per cent., are now electrified.—*Reuter's Trade Service*.

RADIO & TELEPHONY

Australia.—NEW RADIO-TELEGRAPH SERVICE. —A *Reuter* message from Sydney states that a direct radio-telegraph service is being inaugurated between Australia and the United States.

Great Britain.—ISLE OF WIGHT.—The Standing Joint Committee is arranging to provide short-wave transmitters and receivers at an approximate cost of £1,351 at six centres and two mobile transmitters and receivers for police cars. Loud-speaker equipment is to be provided for a further five police cars at a cost of £138.

Japanese Power Situation

Organisation for War Purposes

A " POWER mobilisation plan " for 1941–2 has been prepared by the Japanese Government to meet the growing demands of the munitions industry. The plan includes extensions of power stations and to secure all the necessary coal even if it means further hardships. Cuts in public consumption are expected and rates will be adjusted so that the reduction will not have an adverse effect on the finances of the companies.

Lieut.-Gen. Teiichi Suzuki, President of the Cabinet Planning Board, recently said:—" The power mobilisation programme which has been decided on is a chain of the productive power expansion programme, and all other programmes linked with the National General Materials Mobilisation Plan. The demand for power in Japan is steadily increasing to-day and this is especially the case in the munitions and other strategical industries. As much power as is available will be distributed to these industries, and the demand from other quarters will be checked as much as possible."

The Cabinet has approved the merger of the Tohoku Electric Development Company with the Japan Electric Power Generation and Transmission Company.

The coal situation was recently outlined by Mr Yoshizo Ikeo, President of the Japan Power Company, who said that the allocation for his company for the latter part of 1941 was 2,300,000 tons. Some restriction in supply would be necessary to adjust consumption. The current shortage of materials made it most difficult to continue the exploitation of water power or to construct new generating plants. They were doing their best, but he believed that it would be difficult to complete the construction of thirteen of the nineteen power plants now in hand.

Twenty-seven supply companies with properties valued at 1,000,200,000 yen have been merged in the Japan Power Company. Companies financed with foreign capital, particularly American and British, including the Tokyo Electric Co., are to be merged with the rest.

Power distribution has been divided into nine districts with a chairman for each district. These nine men will also form the organising committee of the company and will carry the power responsibilities of the country.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

S. Smith & Sons (Motor Accessories), Ltd.—Presiding at the annual meeting on December 31st, Mr. W. Henderson-Cleland (chairman) said that although there was a larger trading profit for the year under review, only a small proportion of their gross earnings appeared as net profit after providing for taxation. Shareholders would remember that he indicated in his speech last year that they might have to face a reduction in dividend at the end of the next financial year. He was sure they would agree that in suggesting the reduced dividend the directors were taking the only wise and proper course. The company was endeavouring to conserve its resources as far as was possible, with the present burdens of taxation.

Electric & Musical Industries, Ltd., held its annual meeting on December 31st, when Mr. A. Clark (chairman), who presided, said that the total turnover had increased during the year under review. Normal business had been progressively curtailed by increasing limitations placed by the authorities upon both manufacture and sales. They had endeavoured to secure the equitable distribution to the trade of the limited amount of goods which they were able to manufacture. Export trade from Britain and from their companies and branches outside the British Isles had been handicapped by the difficulties of transport and the closing of more of the Continental markets.

At a subsequent extraordinary general meeting resolutions for the purpose of converting the issued shares into stock were approved.

The Philco Radio & Television Corporation of Gt. Britain, Ltd., is submitting a scheme for dealing with the preference dividend arrears which date from July 1st, 1937, and will amount to £99,750 gross by March 31st next and £120,750 gross by March 31st, 1943. In addition, no allocations to the preference capital redemption fund have yet been made. It is proposed to cancel all the preference dividend arrears and liability for redemption fund allocations up to March 31st, 1943, and to create and issue an additional £60,000 6 per cent. cumulative sinking fund certificates to preference shareholders in the proportion of £17 certificates for every 100 preference held. The certificates will be transferable in amounts of £1 and multiples thereof. Special meetings of shareholders for the purpose of considering the scheme and the amendment of the company's articles of association will be held on January 26th.

Cape Electric Tramways, Ltd., reports a profit for the year to June 30th of £34,146, as compared with £26,911 in the preceding year. The dividend for the year is maintained at 5 per cent. and £50,028 is carried forward (against £50,443 brought in).

The Shawinigan Water & Power Co. has announced a dividend of $0.23 on the common shares for the quarter ended December 31st.

The Globe Telegraph & Trust is paying a quarterly dividend of 1 per cent. net (against 1¼ per cent.).

New Companies

Nimmo, Ltd.—Private company. Registered December 20th. Capital, £3,000. Objects: To carry on the business of manufacturers of, and dealers in, radio, television and telephone apparatus, electrical and general engineers, makers of accumulators, batteries, valves, insulating materials and wireless and electrical components and accessories, etc. J. Nimmo, New Road, Clanfield, Hants, is the permanent managing director.

Independent Plastics, Ltd.—Private company. Registered December 15th. Capital, £1,000. Objects: To carry on the business of manufacturers of plastic articles of all kinds, insulating engineers, metal manufacturers and turners, electricians, etc. Directors: V. N. Scott, 30, Grange Park, Ealing, W.5, and F. E. Smith, 126, Dollis Hill Lane, N.W.2. Solicitors: Oscar Mason & Co., Cliffords Inn, E.C.4.

Leeds Insulating Co., Ltd.—Private company. Registered December 20th. Capital, £100. Objects: To carry on the business of manufacturers and repairers of, and dealers in, refrigerators and cold storage appliances, electrical and general engineers, etc. Subscribers: L. Godlove, 6, Park Square, Leeds, 1, and E. Morant, 16, Woodcliffe Crescent, Chapel Allerton, Leeds, 7. Registered office: 6, Park Square, Leeds, 1.

Laminated Components, Ltd.—Private company. Registered December 29th. Capital, £3 000. Objects: To carry on the business of manufacturers and machinists of, and dealers in, laminated and plastic materials and goods of all kinds, electrical engineers, electrical engineering contractors, lighting specialists, wireless engineers and service agents, etc. Directors: A. G. Snell, Georgian House, Monmouth Drive, Sutton Coldfield, Warwick, and five others. Solicitors: Rooke Bradley & Sharman, Birmingham.

Acru Electrical Tool Manufacturing Co., Ltd.—Private company. Registered December 26th. Capital, £100. Objects: To acquire the business carried on by H. Acker and M. P. Rubert, as the Electric Tool Co., at Gregge Street Mills, Gregge Street, Heywood. Directors: H. Acker, 35, Broad Walk, Wilmslow; M. P. Rubert, 92, Finchley Road, Fallowfield, Manchester, and E. C. Smith, C.A., "Glenluce," Middleton Road, Heywood. Registered office: Albert Mills, Gregge Street, Heywood, Lancs.

Sims Tool and Engineering Co., Ltd.—Private company. Registered December 19th. Capital, £5,000. Objects: To carry on the business of electrical, wireless, mechanical, heating, motor and general engineers, contractors, etc. Subscribers: C. Aukin, solicitor, and J. C. Charles, both of 116, Fenchurch Street, E.C.3. Solicitors: Aukin Courts & Co., 116, Fenchurch Street, E.C.3.

Anthonite, Ltd.—Private company. Registered December 26th. Capital, £5,000. Objects: To carry on the business of electrical, mechanical and general engineers, engineering contractors, manufacturers of and dealers in insulating materials and electrical equipment, etc. Directors: R.

Amberton, Lavender Lodge, Laleham, Middlesex (chairman), Anthony R. Amberton and M. G. Amberton (addresses not stated) and W. O. Jackson, 54, Monks Avenue, New Barnet, Herts. Secretary: W. O. Jackson.

North Eastern Refrigeration Co., Ltd.—Private company. Registered December 12th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in refrigerating, cooling and ventilating plant, gas and electrical goods and accessories, household appliances, etc. Directors: Wm. Trusson, 9, Broughton Avenue, Marton, Middlesbrough, and two others.

G. H. Williams Electrical Co., Ltd.—Private company. Registered December 12th. Capital, £2,000. Objects: To carry on the business of electrical, mechanical and general engineers, manufacturers of and dealers in tools, agricultural implements and engineering accessories, etc. Directors: Mrs. I. M. Cooke and W. P. Cooke, both of 391, London Road, Ewell, Surrey.

Companies' Returns

Statements of Capital

Brush Electrical Engineering Co., Ltd.—Capital, £1,000,000 in £200,000 preference stock, £366,318 ordinary stock, 187,234 ordinary shares of £1 and £246,448 shares of no specified value. Return dated September 2nd. All stock issued and fully paid up. On November 12th, 50,000 5½ per cent. cumulative preference and 27,000 ordinary shares were allotted as fully paid. Mortgages and charges: £390,902.

Chamberlain and Hookham, Ltd.—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £5. Return dated August 1st. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares. £53,510 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges: Nil.

M.K. Electric, Ltd.—Capital, £300,000 in 100,000 6 per cent. preference and 200,000 ordinary shares of £1. Return dated August 14th. All shares taken up. £768 paid. £299,232 considered as paid. Mortgages and charges: £6,600.

Pye, Ltd.—Capital, £335,200 in £150,000 preferred ordinary and £185,200 deferred ordinary stock. Return dated September 24th. All stock taken up. £178,500 paid on £150,000 preferred ordinary and £28,500 deferred ordinary stock. £156,700 considered as paid on £156,700 deferred ordinary stock. Mortgages and charges: Nil.

Gravesend Welding & Electrical Engineering Works, Ltd.—Capital, £5,000 in £1 shares. Return dated June 24th (filed October 20th). 4,000 shares taken up. £1,000 paid. £3,000 considered as paid. Mortgages and charges: Nil.

Erico (Electrical Services), Ltd.—Capital, £10,000 in £1 shares. Return dated July 16th. 8,600 shares taken up. £7,400 paid. £1,200 considered as paid. Mortgages and charges: Nil.

Mansbridge Condenser Co., Ltd.—Capital, £25,000 in £1 shares. Return dated August 6th. All shares taken up. £10,000 paid. £15,000 considered as paid. Mortgages and charges: Nil.

Public Utilities (Electric), Ltd.—Capital, £25,000 in £1 shares. Return dated August 20th. All shares taken up. £25,000 paid. Mortgages and charges: Nil.

Siemens & General Electric Railway Signal Co., Ltd.—Capital, £20,000 in 10,000 "A" ordinary and 10,000 "B" ordinary shares of £1. Return dated July 24th. 3,500 "A" and 3,500 "B" shares taken up. £7,000 paid. Mortgages and charges: Nil.

Electro-Rentals, Ltd.—Capital, £15,000 in £1 shares. Return dated August 4th. 13,100 shares taken up. £13,100 paid. Mortgages and charges: Nil.

Cox Cavendish Electrical Co., Ltd.—Capital, £6,000 in £1 shares. Return dated August 9th. 4,344 shares taken up. £4,344 paid. Mortgages and charges: Nil.

Wholesale Electric Co., Ltd.—Capital, £1,500 in £1 shares. Return dated August 21st (filed September 5th). All shares taken up. £1,500 paid. Mortgages and charges: Nil.

Kye Electrical, Ltd.—Capital, £25,000 in 20,000 preference shares of £1 and 100,000 ordinary shares of 1s. each. Return dated October 10th. 12,502 preference and 92,500 ordinary shares taken up. £17,127 paid. Mortgages and charges: Nil.

La Plata Electric Tramways Co., Ltd.—Capital, £450,000 in £1 shares (200,000 preference and 250,000 ordinary). Return dated October 24th. All shares taken up. £170,007 paid. £279,993 considered as paid. Mortgages and charges: £78,300.

Increases of Capital

Houchin, Ltd.—The nominal capital has been increased by the addition of £4,500 in £1 shares beyond the registered capital of £500.

E. N. Bray, Ltd.—The nominal capital has been increased by the addition of £4,000 beyond the registered capital of £14,000. The additional capital is divided into 4,000 deferred ordinary shares of £1 each.

Mortgages and Charges

Holfords, Ltd.—(A) Debenture charged on the company's property, present and future, dated December 1st, 1941, to secure £200. Holder: G. M. Haworth, 6, Princes Crescent, Hove. (B) Issue on December 1, 1941, of a debenture for £50, part of a series already registered.

Heathfield Cable & Engineering Works, Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated November 27th, 1941, to secure £2,000. Holders: Branch Nominees, Ltd.

Underwood (Electric), Ltd.—Assignment of proceeds of various contracts, dated December 3rd, 1941, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £13,000.

Liquidations

Corporation Electric Transport, Ltd.—Winding up voluntarily. Liquidator, Mr. B. J. Davis, 2, Norfolk Street, Strand, London, W.C.2. Particulars of claims to the liquidator by February 16th.

McGreevy Bros. (Fleetwood), Ltd.—Winding up voluntarily. Liquidator Mr. J. Hopkinson, 21, London Street Fleetwood. Particulars of claims to the liquidator by February 21st.

STOCKS AND SHARES

TUESDAY EVENING.

THE New Year entered the Stock Exchange markets with a firm step, so far as prices of stocks and shares were concerned, and brought with it a fair amount of business in those markets which are more particularly devoted to investment securities. One of the features of the year just ended has been the tight control exercised by the Treasury over the money market, and the effect which this has had in the way of causing gilt-edged prices to advance.

Another potent factor which has operated in the same direction has been the call-up, or "vesting," to use the official term, of millions of pounds' worth of securities—American, African, Indian, etc. Holders of the stocks have been given the option of accepting cash in payment or of reinvesting the money into national war issues. The influence of this policy is to be seen in the manner in which the prices of most gilt-edged stocks finished the past year with substantial rises compared with the quotations prevailing in December, 1940.

Taking a quartet of representative stocks from those quoted in our weekly lists, the following table shows the changes which took place last year :—

Public Boards

Stock.	Dec. 1939	Dec. 1940	Dec.31 1941	Rise
Central Elec. 1950/70	106½	109	110	1
Central Elec. 1963/93	90	94	102	8
London Elec. Trans. Ltd.	87	93	96½	3½
London Pass. Trans. "A"	104½	109½	116½	7

Home Electricity Supply

This time last year, a majority of prices of ordinary shares in the Home electricity supply companies showed declines as compared with the prices of the previous twelvemonth. The position is now reversed. Quotations are substantially higher on the year, for which recovery the main reason has been the absence of any serious air raids for some months past and the flow into shares of these companies of money arising from the vesting already mentioned. The Government's plans, outlined by the War Damage Commission, have formed another sound foundation for confidence.

Dividends were maintained, and there has been no such disappointment in this group as waited upon the fortunes of holders in some of the well-known gas companies' ordinary stocks last year.

The following groups give a fair idea of the manner in which the market in the shares has moved in favour of their holders. It will be noticed that the list is in two divisions : the first comprises shares in the London companies; the other, those in provincial undertakings.

London Companies

Ordinary Shares.	Dec. 1939 s.	d.	Dec. 1940 s.	d.	Dec.31 1941 s.	d.	Rise s.	d.
City of London	26	6	21	3	26	3	5	0
County of London	36	3	32	6	35	0	2	6
London Assoc. Elec.	20	0	15	0	19	6	4	6
Metropolitan ..	37	0	32	6	36	3	3	9
Northmet Power	37	0	31	3	35	0	3	9
South London ..	22	0	20	0	25	0	5	0

Provincial Companies

Ordinary Shares.	Dec. 1939 s.	d.	Dec. 1940 s.	d.	Dec.31 1941 s.	d.	Rise s.	d.
Bournemouth & Poole	58	9	43	9	53	9	10	0
Clyde Valley ..	33	3	33	9	37	6	3	9
Elec. Dis. Yorks.	35	9	35	0	42	0	7	0
Lancs Light & Power ..	28	9	27	6	33	9	6	3
Midland Counties	35	0	32	6	37	6	5	0
Midland Elec. Power ..	36	3	33	9	39	6	5	9
North Eastern ..	27	6	25	0	29	6	4	6
Northampton ..	42	6	40	0	44	6	4	6
Scottish Power ..	32	6	33	3	38	9	5	6
Yorkshire Elec.	33	9	33	9	39	6	5	9

Manufacturing and Equipment

Throughout the whole of 1941 there was a steady pressure to buy the best-class ordinary shares in industrial and commercial companies. The group associated with the electrical industry took a foremost place amongst the industrials to which the attention of the investor, pure and simple, was turned. A number of the companies in this class are, of course, amply fortified with liquid assets, besides being so long established that their names have come to be a household word to both customers and investors. Here are some leading examples :—

Industrial Companies

Ordinary Shares.	Dec. 1939 s.	d.	Dec. 1940 s.	d.	Dec.31 1941 s.	d.	Rise s.	d.
Assoc. Electrical Ind.	38	9	40	0	43	9	3	9
Babcock & Wilcox	41	3	39	6	45	0	5	6
British Aluminium ..	50	0	40	9	45	9	5	0
British Insulated	80	0	82	6	90	0	7	6
Callender's ..	60	0	62	6	73	9	11	3
Crompton Parkinson (5s.) ..	17	6	17	6	21	3	3	9
English Electric	31	3	28	9	37	6	8	9
G.E.C.	75	0	77	0	78	9	1	9
Ever Ready (5s.)	26	0	25	6	29	6	4	0
Johnson & Phillips ..	41	3	45	0	55	9	10	9
J. Lucas ..	56	3	50	9	65	0	14	3
Siemens ..	20	0	17	6	25	0	7	6

The rises in this catalogue, which was taken at random, range from 1s. 9d. to 14s. 3d.

(*Concluded on page* 61)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Jan. 5	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	53/9	..	4 12 9
British Power and Light	7	6	26/6	..	4 10 7
City of London	7½	7	26/3	..	5 6 9
Clyde Valley	8	8	37/6	..	4 5 4
County of London	10½	8	35/–	..	4 11 5
Edmundson's:					
7% Pref.	7	7	32/–xd	..	4 7 6
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	43/9	..	5 14 2
Elec. Supply Corporation	11½	10	43/9	..	4 11 4
Isle of Thanet	2	Nil	9/–	..	—
Lancs Light and Power	7½	7½	33/9	..	4 9 0
Llanelly Elec.	5½	5½	22/–	..	5 0 0
Lond. Assoc. Electric	5½	4½	19/6	..	4 12 4
London Electric	7	7	24/6	..	5 14 3
London Power Deb. Red.	5	5	104	..	4 16 2
Metropolitan	10	8	36/3	..	4 8 5
Midland Counties	8	8	37/6	..	4 5 4
Mid. Elec. Power	9	9	39/6	..	4 11 2
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	29/6	..	4 15 0
7% Pref.	7	7	33/–	..	4 4 10
Northampton	10	10	44/6	..	4 10 0
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/–	..	4 0 0
6% Pref.	6	6	30/–	..	4 0 0
Richmond Elec.	6	6	23/9	..	5 1 1
Scottish Power	8	8	38/9	..	4 2 9
Southern Areas	5	5	18/3	..	5 9 7
South London	7	7	25/–	+1/6	5 12 0
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	20/–	..	4 10 0
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	3/6	..	—
Calcutta Elec.	8*	7*	35/–	–6d.	—
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/–)	7½	7½	12/–	..	6 5 0
Madras Elec.	6*	4*	22/6	..	3 11 1
Montreal Power	1½	1½	24½	..	6 2 5
Palestine Elec. "A"	Nil	Nil	20/9	..	—
Perak Hydro-elec.	6	7	7/6	–3/9	18 13 4
Shawinigan Power	83cts.	90cts.	15	+1½	—
Tokyo Elec. 6%	6	6	12½	–1	—
Victoria Falls Power	15	15	80/–xd.	+6d.	3 15 0
Whitehall Inv. Pref.	7½	7½	15/–	..	10 0 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Jan. 5	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110	..	4 11 1
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	+½	4 5 9
1963–93	3½	3½	102	+1	3 8 8
1974–94	3½	3½	99	+1	3 5 8
London Elec. Trans. Ltd.	2½	2½	96½	..	2 11 10
London & Home Counties 1955–75	4½	4½	108½xd	..	4 3 0
Lond. Pass. Trans.:					
A	4½	4½	117½	+1	3 16 7
B	5	5	115½	+1	4 6 7
C	1½	3	40	–1	7 10 0
West Midlands J.E.A. 1948–68	5	5	109½	..	4 11 4
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	105½	..	5 13 9
Def.	1½	1½	24½	..	6 2 5
Anglo-Portuguese	8	8	13/9	–1/16	11 12 10
Cable & Wireless:					
5½% Pref.	5½	5½	101½	..	5 8 4
Ord.	4	4	65½	..	6 2 4
Canadian Marconi $1	Nil	4cts.	5/6	..	2 15 6
Globe Tel. & Tel.:					
Ord.	8½*	8½*	30/–	..	—
Pref.	6	6	28/9	..	1 3 4
Great Northern Tel.: (£10)	20	20	14½	..	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	27/6	..	5 9 1
Oriental Tel. Ord.	11½*	16	65/–	..	4 18 6
Telephone Props.	6	6	10/–	..	12 0 6
Tele. Rentals (5/–)	10	10	8/6xd	+6d.	5 17 8
Traction and Transport					
Anglo. Arg. Trans:					
First Pref. (£5)	Nil	Nil	4/6	+2/–	—
4% Inc.	Nil	Nil	7½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	905	..	5 0 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	43/9	..	3 13 1
Brazil Traction	$1	50c.	13½	+2½	—
Calcutta Trams	8	5½	21/3	–1/6	5 3 6
Cape Elec. Trams	5	5	19/–	–1	5 5 3
Lancs Transport	10	10	45/–	+½	4 9 0
Mexican Light:					
1st Bonds	5	5	75	..	6 13 4
Rio 5% Bonds	5	5	92½	..	5 8 3
Southern Rly.:					
5% Prefd.	5	5	63½	..	7 17 6
5% Pref.	5	5	106½	+1	4 14 0
T. Tilling	10	10	46/3	..	4 6 6
Tilling & B.A.	8*	7*	52/6	..	2 13 4
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Jan. 5	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	23/–	..	6 10 4
Assoc. Elec.:					
Ord.	10	10	43/9	..	4 16 3
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	48/9	–⅛	5 2 6
Babcock & Wilcox	11	11	45/–	..	4 17 9
British Aluminium	12½	10	45/9	..	4 7 4
British Insul. Ord.	20	20	90/–	..	4 9 0
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	12/6	..	4 0 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	73/9	..	4 1 4
Chloride Elec. Storage	15	15	71/3	..	4 4 3
Consolidated Signal	17	17	80/–	..	4 5 0
Crabtree (10/–) ..	17½	17½	28/3	..	6 4 0
Crompton Parkinson Ord. (5/–) ..	30	20	21/3	..	4 14 1
E. K. Cole (5/–) ..	Nil	7	9/–	*–6d.	3 17 9
E.M.I. (10/–) ..	Nil	6	15/–	+⅛	4 0 0
Electric Construction	10½	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	53/9	..	4 13 0
Elect. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	37/6	..	5 6 8
Ensign Lamps (5/–)	25	25	16/3	+⅛	7 13 10
Ericsson Tel. (5/–) ..	25*	22*	40/–	..	2 15 0
Ever Ready (5/–) ..	40	40	29/6	–6d.	6 15 7
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	26/3xd	..	5 6 10
G.E.C.:					
Pref.	6½	6½	32/6	..	4 0 0
Ord.	20	17½	78/9	..	4 8 10
Greenwood & Batley	15	13	26/3	..	9 18 2
Hall Telephone (10/–)	15	10	15/7½	..	6 8 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	45/–	..	6 13 4
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion	32½	30	107/6	+½	5 11 6
J. Lucas	15	15	65/–	..	4 12 4
Johnson & Phillips	15	15	55/9	..	5 8 1
Lancashire Dynamo	20	20	65/–	..	6 3 1
Laurence, Scott (5/–)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	25/–	..	6 0 0
Mather & Platt ..	13½	10	41/3	..	4 14 1
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	91/3	+⅛	4 7 9
Pye Deferred (5/–) ..	25	25	15/–	+⅛	8 6 8
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	56/3	..	4 9 0
Siemens Ord. ..	7½	7½	25/–	..	6 0 0
Strand Elec. (5/–) ..	2	4	3/6	..	5 14 4
S. Smith (1/–) ..	50	37½	6/3	..	6 0 0
Switchgear & Cowans (5/–) ..	10	15	10/–	..	7 10 0
Tel. Condenser (10/–)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	8/3	..	5 9 1
Tube Investments ..	23¼	20	87/–	..	4 12 0
Vactric (5/–) ..	4	Nil	3/6	..	—
Vickers (10/–) ..	10	10	16/9	..	5 19 5
Ward & Goldstone (5/–)	20	20	16/6	..	6 1 3
Westinghouse Brake	17½	10	51/3	..	3 18 2
Walsall Conduits (4/–)	55	55	32/6	..	6 15 4
West, Allen (5/–) ..	7½	7½	5/–	..	7 10 0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 59)

The effect can be further heightened by reference to the ordinary shares in another twelve companies connected with the manufacturing and equipment branch:—

A Further Selection

Ordinary Shares.	Dec. 1939 s. d.	Dec. 1940 s. d.	Dec.31 1941 s. d.	Rise s. d.
Automatic Telephone & El. ..	42 6	40 0	48 9	8 9
Crabtree (10s.) ..	21 3	22 6	28 3	5 9
Elec. & Musical Ind. (10s.) ..	7 6	7 9	15 0	7 3
Elec. Construct.	33 9	27 6	34 6	7 0
Enfield Cable ord.	46 3	47 6	53 9	6 3
Ericsson Tel. (5s.)	35 0	32 6	40 0	7 6
Henley's (5s.) ..	17 6	18 9	22 6	3 9
Lancs. Dynamo ..	55 0	47 6	65 0	17 6
Mather & Platt ..	44 6	34 0	41 3	7 3
Reyrolle	60 0	46 3	56 3	10 0
Telegraph Construction ..	32 6	35 0	41 3	6 3
Westinghouse Brake ..	45 0	40 0	51 3	11 3

The above recital of prices over the past twelve months is one which will cheer—and possibly surprise—the investor in stocks and shares. It may be accepted as a favourable omen for 1942.

Telephone and Telegraph

The hand of the investor is apparent in the rises which have taken place amongst telephone, telegraph and communication issues. Cable & Wireless Preference, which stood at 93½ a year ago, is now a little over par. The rise in Marconi Marines has lifted the price to the same as that of two years ago, though in the interval it has been down well below 20s. Great Northern Telegraphs and International Telephone and Telegraph stand at fixed prices; business in the shares is permitted only under restriction. We quote six examples :—

Communication Companies

Stock or Share.	Dec. 1939	Dec. 1940	Dec.31 1941	Rise
Anglo-American pref.	94½	99	105½	6½
Cable & Wireless pref.	92½	93½	101½	8
Cable & Wireless ord.	56½	56½	65½	9
Great Northern	20½	12½	14½	2
International Tel. & Tel. ..	5	3	3	—
Marconi Marine	27/6	19/3	27/6	8/3

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

22567. "Thermo-siphonic circulating systems particularly for refrigerating apparatus." N. E. Af. Kleen. August 3rd, 1939. (541744.)

1940

6311. "Drives for valves and the like." Igranic Electric Co., Ltd. April 10th, 1939. (541717.)

7565. "Dielectric material and method of making the same." Titanium Alloy Manufacturing Co. April 27th, 1939. (Cognate application, 7566/40.) (541750.)

7920. "All-wave loop receiver." Philco Radio & Television Corporation. June 3rd, 1939. (541867.)

8529. "Electrical outlet sockets." J. F. O'Brien. May 11th, 1939. (541718.)

9886. "Line identification in telephone or like signalling systems." Automatic Telephone & Electric Co., Ltd., and R. Taylor. June 6th, 1940. (541722.)

9937. "Electrical calculating apparatus." Contraves Akt.-Ges. June 10th, 1939. (Addition to 520228.) (541761.)

9983. "Telephone and like systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. June 7th, 1940. (541731.)

9995. "Antenna systems." Electrical Research Products, Inc. July 26th, 1939. (541870.)

9997. "Methods of manufacturing photo-electric cells." Baird Television Ltd., and G. A. R. Tomes. June 7th, 1940. (541785.)

10040. "Couplings, valves, and the like." Broom & Wade, Ltd., & E. Elwess. June 8th, 1940. (541842.)

10101. "Electrical wiring systems incorporating electrical switches." J. F. O'Brien. July 7th, 1939. (541766.)

10109. "Illuminated mimic diagrams." J. Gray, and Metropolitan-Vickers Electrical Co., Ltd. June 10th, 1940. (541809.)

10121. "Absorption refrigerating apparatus." Hoover, Ltd. July 8th, 1939. (541792.)

10142. "Sealing of the ends of powder-insulated electric cables." Pyrotenax, Ltd., and G. D. Clothier. June 11th, 1940. (541811.)

10164. "Manufacture of sealed connections between metal pieces and insulating materials." Standard Telephones & Cables, Ltd., and E. C. Lee. June 11th, 1940. (541816.)

10165. "Solenoid-operated electric vibrators." Standard Telephones & Cables, Ltd., and W. H. M. Hellier. June 11th, 1940. (541817.)

10227. "Gas turbine plants." Sulzer Freres Soc. Anon. June 28th, 1939. (Cognate application, 10228/40.) (541845.)

10241. "Control knobs of radio receivers and like apparatus." Kolster-Brandes, Ltd., and P. A. Tiller. June 12th, 1940. (541846.)

10360. "Photo-electric cells." Baird Television, Ltd., and G. A. R. Tomes. June 14th, 1940. (541794.)

10549. "Communication exchange systems." Standard Telephones & Cables, Ltd. July 28th, 1939. (541768.)

11089. "Electron-discharge devices." British Thomson-Houston Co., Ltd. June 29th, 1939. (541824.)

11116. "High-frequency relay systems." Marconi's Wireless Telegraph Co., Ltd. June 30th, 1939. (541796.)

11757. "Photo-electric cells." G. A. Vezzi. July 16th, 1940. (541739.)

11919. "Photo-electric cells." Cinema-Television, Ltd., and G. A. R. Tomes. July 19th, 1940. (541798.)

12324. "Variable distribution electrical link systems." H. R. S. Heath and R. W. Bill. July 30th, 1940. (541741.)

12370/12373. "Two-way transmission systems." Associated Electric Laboratories, Inc. August 14th, 1939. (541742/541769.)

13529. "Electro-magnetic couplings for the transmission of mechanical power." English Electric Co., Ltd., J. E. Calverley and H. S. Carnegie. August 27th, 1940. (Cognate application, 9795/41.) (541825.)

15429. "Control of electric motors." F. Crowther, G. P. F. Newlands, and Metropolitan-Vickers Electrical Co., Ltd. October 18th, 1940. (541826.)

15462. "Boxes or casings for housing electric switches and other electrical devices or apparatus." Callender's Cable & Construction Co., Ltd., and S. J. Bryce. October 19th, 1940. (541827.)

1941

1736. "Thermostatic temperature regulators." Landis & Gyr Soc. Anon. April 26th, 1940. (541830.)

9600. "Electron-discharge devices and circuit arrangements embodying such devices." W. S. Brown. February 5th, 1940. (Divided out of 539419.) (541860.)

9636. "Drives for valves and the like." Igranic Electric Co., Ltd. April 10th, 1939. (Divided out of 541717.) (541743.)

Australian Plant Extensions

IT is reported in *Tenders* (Melbourne) that a contract for the supply of a Mirrlees-G.E.C. 450-kW generator has been placed with Mirrlees, Bickerton and Day Pty., Ltd., by Walkers, Ltd., Maryborough, for an important Queensland industry.

Tenders were recently called by the Albany Council, W.A., for the following equipment for extensions to the electric power plant: Two Babcock & Wilcox boilers, about 8,000 lb. evaporative capacity each, 160-180 lb. working pressure, with feed pumps; surface condensing equipment, about 20,000 lb. capacity; economisers, 2-boiler size; two 500 g.p.m. circulating pumps against a 80-100 ft. head of salt water; one 400-600 kVA engine or turbine set, 415 V, 50 cycles, with control panel; one 400-600 kVA, 3,300/415-250-V transformer; one 250-kW, 415-V, 50-cycle alternator; together with valves, piping, accessories, sundries, etc.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Birmingham.—January 14th. Salvage Department. Lead-plate batteries for electric refuse-collection vehicles. (December 19th.)

Kilmarnock.—January 15th. Town Council. Various works, including electrical, at men's rest room, and alterations and additions to abattoir. Specifications, etc., from the burgh surveyor.

Pittenweem (Fife).—Town Council. Various works (including electrical) at new cemetery. Schedules from L. A. Rolland, 47, High Street, Leven.

Plymouth.—January 17th. Electricity Supply Department. Corrugated copper expansion pieces for circulating water system. (January 2nd.)

South Africa.—POST OFFICE DEPARTMENT.—March 26th. Automatic exchange equipment for Cambridge, East London. P.O. Tender 16.

Orders Placed

Friern Barnet. — Emergency Committee. Accepted. Rewiring A.R.P. headquarters (£23). —Northmet Power Co.

Ossett.—Water Committee. Accepted. Installation of electric pumping plant at waterworks. —Harland Engineering Co., Ltd.

Manchester.—Electricity Committee. Accepted. Switchgear equipment.—Ferguson, Pailin, Ltd. Reconstruction of air supply arrangements to boilers.—John Thompson Water-Tube Boilers.

Sedgley.—Works Committee. Accepted. Electric lighting at Council House (£48).—D. L. Moss.

Sheffield.—Watch Committee. Accepted. Electric lift (£170).—Sheffield Vulcanising Co.

Swansea.—Electricity Committee. Accepted. Erection of canteen at the power station (£2,580). —Peter Lind & Co., Ltd.

Watford.—Electricity Committee. Accepted. One 250-kVA transformer (£220).—Metropolitan-Vickers Electrical Co., Ltd. One 75-kVA transformer (£103) and three 50-kVA transformers (£250).—Brush Electrical Engineering Co., Ltd.

Wood Green.—Emergency Committee. Accepted. Electric lighting and heating at St. Michael's School shelter (£103).—Northmet Power Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Alnwick.—Canteens, Alnwick School; W. W. Tasker, county architect, Mitford Road, Morpeth.

Aston Fields.—Works canteen, St. Godwald's Road, for L.M.S. Railway; A. K. Wallace, chief engineer, Euston Station, N.W.1.

Bedlington (Northumberland).—Canteens; Bedlington Coal Co.

Blackley.—Works; Broughton, Atkinson Eagle & Co., architects, 37, Brown Street, Manchester.

Bromsgrove.—Additions, Finstall Road and Finch End Lane; Pancheri & Hack, woodworkers, Finstall Road.

Cheetham.—Extensions; T. H. Seddon & Co., builders, 13a, New Brown Street, Manchester.

Derbyshire.—Reconstruction of Codnor Park Council School, Ironville, and provision of youth centre, Eckington; J. Harrison, county architect, County Offices, St. Mary's Gate, Derby.

Donnington.—Houses, Donnington Wood, for Wellington R.D.C.; J. B. Cooper, architect, Coleridge Chambers, 177, Corporation Street, Birmingham.

Dudley.—Canteen; Danks of Netherton, Ltd., boiler makers, Netherton.

Durham.—Canteen at Shildon Senior Boys' School; county architect, 34, Old Elvet, Durham.

Enfield.—Canteen, Great Cambridge Road; Belling & Lee, Ltd.

Extension, Ripaults, Southbury Road; A. H. Durnford.

Extension, Alma Road; Enfield Tool & Manufacturing Co., Ltd.

Guildford.—Report centre, High Street (£952); H. Ashenden, Ltd.

Sawmill, Walnut Tree Close; Parker Road Timber Co.

Hebburn-on-Tyne.—Workshop extensions; Alex. Anderson, Ltd., contractors, Stanmore Road, Newcastle-on-Tyne.

Hereford.—Wartime nursery; Herbert Skyrme, architect.

Horden (Co. Durham).—Canteen at colliery; Jos. Huntley & Sons, contractors, Marion Street, Sunderland.

Jarrow-on-Tyne.—Adapting premises in Bede Burn Road as domestic science centre for Durham C.C.; county architect, 34, Old Elvet, Durham.

Keighley.—Booster house extension at waterworks; borough engineer.

Alterations, Hole Fold Farm, Wheathead Lane; West Riding county architect.

Lancaster.—Flats, Watery Lane; R. Thompson & Morris, builders, Queen Street Works, Lancaster.

Levenshulme. — Extensions to Grosvenor Garage; W. C. Coulson, architect, 29, Westhulme Road, Withington.

London.—ST. MARYLEBONE.—Cleansing centre, Greenwell Street (£1,608); borough engineer.

Manchester.—Rebuilding two-storey warehouse, Mary Street, Strangeways; Holmes, Ltd., wholesale grocers, Otter Works.

Middlewich.—Joinery works, King Street; Pochins' (Manchester), Ltd., Castle Street Works, Knott Mill, Manchester.

Newcastle-on-Tyne.—Garage and stores, Lovaine Crescent; A. Pringle, Ltd., contractors, Cramer Dykes, Gateshead-on-Tyne.

Northampton.—Factory alterations, Bembridge Drive; Painton & Co., Ltd.

Northumberland.—Cooking depots at Blagdon and other places in the county; W. W. Tasker, county architect, Mitford Road School, Morpeth.

Ossett.—Canteen, Greenfield Mills; J. E. Glover.

Richmond (Yorks).—Decontamination station, Gilling Road, for North Riding C.C.; R. Sawtell, county surveyor, County Hall, Northallerton.

Seaton Valley (Northumberland).—A.R.P. report centre for the U.D.C.; T. W. Burgess, surveyor, Council Offices, Seaton Delaval.

Sedgley.—Canteen, Dibdale Works; Gibbons (Dudley), Ltd.

Playhouse and ballroom (£5,000); S. Butler, St. Jude's Road, Wolverhampton.

Sheffield.—Extension to Bakery, Southey Hill Davies' Food Stores (£1,000); D. O'Neill & Son, builders, Solly Street, Sheffield,1.

Shildon.—British Restaurant, Church Street; U.D.C. surveyor.

Swinton.—Additions, Boundary Road; Matthews & Yates, Ltd., Cyclone Works.

Extensions to commercial garage, 25, Chorley Road; Lawton's Transport Co., Ltd., Avanti Works, Manchester Road, Clifton, Manchester.

Garage; A. Cordwell, borough surveyor, Town Hall, Chorley Road, Swinton, Lancs.

Watford.—Garage extension, Church Road; L.M.S. Railway Co.

West Bromwich.—Central Kitchen, Old Drill Hall, Carters Green; borough engineer.

York.—Additions, Wigginton Road; Rowntree & Co., Ltd.

Yorkshire.—Fire station, canteens, rest rooms, etc.; Beedon, Ltd., building contractors, Park Lane, Thrybergh, near Rotherham.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, January 22nd, 5 p.m. London. Papers: "A Totally-Electrified Cane Sugar Factory," by Mr. L. B. Whitaker, and "Electricity in a Beet Sugar Factory," by Mr. B. Smith.

Transmission and Meter & Instrument Sections.—Wednesday, January 14th. London. Paper: "Measurement of Protective Gear on Power Supply Systems," by Messrs. W. Casson and F. H. Birch.

Installations Section.—Thursday, January 15th, 5 p.m. London. Paper: "Some Problems in the Application of Electric Heating to Residential and Commercial Premises," by Mr. W. Gilchrist.

Wireless Section.—Tuesday, January 27th, 5 p.m. London. Informal meeting.

Western Centre.—Monday, January 12th, Royal Hotel, Cardiff. Wartime luncheon, followed by a discussion on "Electrical Supply Problems Arising from the War," to be opened by Mr. W. A. H. Parker. Tickets (6s. 6d. each) can be obtained from Mr. J. B. G. Lewis, hon. assistant secretary, Principality Buildings, Queen Street, Cardiff.

Mersey and North Wales (Liverpool) Centre.—Monday, January 19th, 5 p.m. Liverpool Royal Institution, Colquitt Street. Paper: "The Electricity Supply (Meters) Act, 1936—Its Legal and Technical Implications," by Mr. Alwyn Evans.

North-Western Centre.—Saturday, January 24th, 2.30 p.m. Engineers' Club, Albert Square, Manchester. Joint meeting with the Institution of Post Office Electrical Engineers. Papers: "Metal Rectifiers," by Messrs. A. C. Williams, Ph.D., M.Sc., and L. E. Thompson, B.Sc., and "The Characteristics and Applications of the Selenium Rectifier," by Mr. E. A. Richards, B.Sc.

London Students' Section.—Monday, January 19th, 7 p.m. Paper: "Generation and Amplification of Micro-Waves," by Mr. F. Cox. Saturday, January 24th, 3 to 7.30 p.m. Lysbeth Hall, Soho Square, W.1. Tea dance. Tickets, 3s. 6d. single and 6s. 6d. double from Mr. E. M. Hickin, 57, Oldborough Road, North Wembley.

North Midland Students' Section.—Saturday, January 10th, 2.30 p.m. Hotel Metropole, King Street, Leeds. Address on "Transformers," by the Centre chairman.

North-Eastern Students' Section.—Friday, January 16th, 6.30 p.m. Neville Hall, Westgate Road, Newcastle-upon-Tyne. Paper: "Electrical Musical Instruments," by Mr. P. D. Gibbons.

British Institution of Radio Engineers.—*London Section.*—Saturday, January 10th, 3 p.m. Federation of British Industries, 21, Tothill Street, London, S.W.1. Paper: "Recent Developments in the Design and Application of the Cathode Ray Oscillograph," by Mr. W. Wilson, D.Sc., B.Eng., M.I.E.E. (G.E.C. Development Laboratory).

Institution of Rubber Industry.—*London Section.*—Monday, January 12th, 6 p.m. Caxton Hall, London, S.W.1. Papers: "Soft Rubber Moulding," by Mr. C. H. Birkitt, B.Sc., and "Hard Rubber Moulding," by Mr. B. L. Davies, M.Sc.

Electrodepositors' Technical Society.—*London Branch.*—Monday, January 12th, 4 p.m. Northampton Polytechnic, E.C.1. Paper: "Practical Problems in Electro-tinning," by Dr. S. Baier.

Stoke-on-Trent Association of Engineers.—Saturday, January 10th, 6 p.m. Association's room at the offices of Robert Hyde & Son, Ltd. Address on "Arc Welding," by a representative of Murex Welding Processes, Ltd.

Association of Supervising Electrical Engineers.—Saturday, January 17th, 2.30 p.m. Lighting Service Bureau, Savoy Hill, London, W.C.2. Lecture: "The Application of Switchgear to Industrial Distribution Systems," by Mr. W. A. Brown, A.M.I.E.E.

Association of Mining Electrical and Mechanical Engineers.—Saturday, January 17th. Caerphilly. Paper: "Considerations Regarding the Layout of Colliery Electrical Systems," by Mr. A. W. Kidd.

Electrical Industries Benevolent Association.—*Northern Counties Area.*—Monday, January 26th, 3 p.m. Tilley's Restaurant, Blackett Street, Newcastle-upon-Tyne, 1. Annual general meeting under the chairmanship of Mr. E. J. Edgar.